2017

Rice Varieties

& Management Tips

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Rice Varieties and Management Tips 2017

This publication handles information likely to become dated in a short time, such as changes in varieties, pest management products and other recently developed production practices. Projected cost and return information is also very important in management decisions. Additional information can be found in the Crop Enterprise Budgets publication, with a search from the LSU AgCenter home page at www.LSUAgCenter.com.

Decisions on variety selection are some of the earliest and most critical you will make. This information will help you decide which rice varieties are best-suited to your particular growing conditions.

The varieties are grouped on the basis of grain type (long or medium/short) and use (special purpose). After each variety name are letters in parentheses to indicate the state of origin of the variety. A brief description of the agronomic characteristics of each of the recommended varieties is provided. In addition to recommended varieties, descriptions of other varieties are included. These are varieties that are not recommended but may be grown on limited acreage. In some cases, the lines have performed well in testing, but the number of years in testing is less than the minimum required for recommendation.

Rice Varieties and Management Tips 2017, publication 2270, is available with a search from the LSU AgCenter home page at www.LSUAgCenter.com. Additional rice production information can be found in the Louisiana Rice Production Handbook, publication 2321, also available through the LSU AgCenter home page, www.LSUAgCenter.com.

Data were generated at six research locations: the H. Rouse Caffey Rice Research Station in Crowley and off-station locations in Acadia, Evangeline, Jefferson Davis, St. Landry and Vermilion parishes.

The following information is included:

Yield: Dry weight, lb/A

Milling:

a. Head - percent of whole kernels after milling.
b. Total - percent of all kernels (whole and broken) after milling.

Seedling Vigor: Vigor ratings are based on subjective estimates made during yield testing.

Days to 50 percent Heading: Average number of days from emergence to 50 percent heading. This occurs when half of the flag leaf sheaths have panicles emerging from them. Most varieties will reach harvest maturity (20 percent grain moisture) within 30 to 40 days after heading under normal conditions. Medium grains normally require five to seven days longer after heading to reach harvest maturity than do long grains under similar environmental conditions. Clearfield (CL) varieties are resistant to Newpath and Beyond herbicides for use in the Clearfield production system.

Rice Varieties and Hybrids

Caffey (LA): an early, short-stature, medium-grain rice variety. It has excellent yield potential, like Jupiter. Caffey also has excellent milling quality with low level of chalk and a very bold milled grain. The variety is comparable in maturity to Jupiter and Neptune. Caffey is similar in plant height to Jupiter but displays somewhat more resistance to lodging. Caffey is moderately susceptible to sheath blight, blast, bacterial panicle blight and straighthead and moderately resistant to narrow brown leaf spot.

Catahoula (LA): an early, semidwarf, long-grain variety with excellent yield potential and very good milling as well as other grain quality traits. The variety is similar in plant type, maturity and plant height to Cocodrie. Catahoula is rated as susceptible to sheath blight and straighthead and resistant to blast. It has displayed good seedling vigor and second crop potential. Catahoula has good straw strength and has displayed fairly good resistance to lodging.

Cheniere (LA): an early, high-yielding, high-quality, long-grain variety. It has displayed excellent yield potential, good lodging resistance and moderate resistance to physiological straighthead. It is moderately susceptible to blast and susceptible to sheath blight. The variety has displayed excellent grain quality characteristics and is similar in maturity to Cypress.

CL111 (LA): a very early, short-stature, long-grain, Clearfield rice variety developed at the LSU AgCenter H. Rouse Caffey Rice Research Station. It averages about five to seven days earlier than CL151 in number of days from emergence to harvest maturity. CL111 has shown slightly lower yield potential than CL151 but has higher head rice yields and superior grain quality. The variety is similar in height to CL151 but it is more resistant to lodging. It is moderately susceptible to blast and very susceptible to sheath blight and bacterial panicle blight. It has excellent seedling vigor and very good second crop potential.

CL151 (LA): a very early, semidwarf, long-grain variety that displays excellent yield potential. The variety is rated very susceptible to sheath blight, susceptible to blast and very susceptible to straighthead. CL151 has consistently shown high head rice yields but has displayed somewhat more kernel chalk than some other long-grain varieties. The variety has very good seedling vigor and second crop potential. CL151 is moderately susceptible to lodging. Under the severe level of blast disease pressure observed in southwest Louisiana in 2012, this variety displayed a high level of susceptibility to the disease. An appropriate fungicide program is essential and timing of fungicide applications is critical. Please refer to the disease section in this publication for additional information on fungicide use, rates and timings.

CL152 (LA): an early, semidwarf, long-grain, Clearfield rice variety. The variety has displayed very good yield

Table 1. Agronomic Characteristics and Yields of Recommended Rice Varieties (2014-2016) in Louisiana.

Variety	Grain Type	Seedling Vigor	Lodging	Days to 50% Heading	Plant Height (inches)	Milling % (Whole - Total)				Grain Yield			
						2014	2015	2016	Mean*	2014	2015	2016	Mean*
Long Grain													
Catahoula	L	G	R	81	37	69-76	58-75	66-74	63-75	8307	7201	8358	7882
Cheniere	L	G	R	82	35	71-77	64-76	63-72	65-75	7623	7458	7937	7662
Cocodrie	L	G	MR	81	36	70-77	67-75	63-73	66-74	8352	7347	6940	7479
LaKast	L	G	S	80	41	64-73	61-75	55-73	58-73	9021	8208	8482	8516
Mermentau	L	G	MR	80	35	70-75	72-77	60-72	67-74	7987	7485	7913	7762
Presidio	L	G	R	81	38	68-74	68-75	65-73	66-74	7476	6574	7179	7016
Roy J	L	G	MR	85	39	69-76	53-72	54-72	56-72	8384	7362	7599	7713
XP753	L	G	S	79	41	66-73	62-76	66-74	64-74	10120	10004	10738	10280
Medium Grain													
Caffey	M	G	MR	84	35	67-71	63-71	66-68	65-70	9267	7935	7889	8275
Jupiter	M	G	MR	84	35	67-72	49-72	66-70	59-71	9575	7433	8308	8296

* Mean is the average of 16 yield trials conducted over the three-year period. Mean is not the average of the three years (2014-2016), since there were different numbers of trials each year.
Height: Height at maturity in inches from soil line to extended panicle.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant will lodge, especially under excessive levels of nitrogen.
Abbreviations: R = resistant, MR = moderately resistant, MS = moderately susceptible, VG = very good, G = good.

potential, but typical yields are somewhat lower than CL151. However, CL152 has very good resistance to lodging and is superior to CL151 in this trait. The variety also has excellent milling quality and has a low level of chalk under normal growing conditions. It is about three days later in maturity than CL151. CL152 has shown good second crop potential. The variety is susceptible to sheath blight and moderately susceptible to blast, narrow brown leaf spot, and bacterial panicle blight. CL152 is moderately resistant to straighthead. Under the severe level of blast disease pressure observed in southwest Louisiana in 2012, this variety displayed a moderate level of susceptibility to the disease. An appropriate fungicide program is essential and timing of fungicide applications is critical. Please refer to the disease section in this publication for additional information on fungicide use, rates and timings.

CL153 (LA): an early, semidwarf, long-grain rice variety that displays excellent yield potential. CL153 has shown very good head rice yields and less grain chalk than CL151. The variety has very good resistance to blast disease. CL153 has shown yield potential comparable to or slightly lower than CL151. CL153 is similar in maturity and plant height to CL151 but has also shown better lodging resistance. The variety has good seedling vigor and has shown good second crop yield potential.

CL163 (MS): a good yielding, long-grain, Clearfield rice variety that possesses extra high amylose that is favored by some processors. It has very good grain appearance and high head rice yields. It has shown to be very susceptible to blast disease in south Louisiana.

CL172 (AR): an early, semidwarf, long-grain Clearfield line. The variety has shown good yield potential and excellent grain appearance quality. CL172 is moderately resistance to blast disease. CL172 is similar in maturity and height to CL151 but has shown better resistance to lodging. The variety also has good seedling vigor and second crop potential in limited testing.

CL271 (LA): a Clearfield, medium-grain variety with very good yield potential for first crop and ratoon and excellent grain quality. CL271 is moderately resistant to blast and Cercospera, moderately susceptible to bacterial panicle blight and susceptible to sheath blight. The variety is moderately susceptible to lodging and moderately resistant to straighthead disorder. CL271 is similar to Caffey and Jupiter in plant height and maturity.

CL272 (LA): a Clearfield, short stature, medium-grain variety with very good yield potential, having yielded comparable to Jupiter and CL271 in multiple year testing. Grain quality of CL272 appears to be superior to CL271. The variety has also shown good ratoon crop yield potential in limited testing. CL272 has shown somewhat more susceptibility to blast than CL271 and is moderately susceptible to Cercospora, bacterial panicle blight and sheath blight. The variety is moderately susceptible to lodging.

CLXL729 (RiceTec): a very high-yielding, long-grain hybrid with resistance to Newpath herbicide for use in the Clearfield production system. CLXL729 has excellent yield characteristics and fair milling characteristics. It should be harvested at optimum grain harvest moisture (18-20 percent) to maximize milling yields. The hybrid also has excellent seedling vigor. CLXL729 has a good disease package and is moderately resistant to sheath blight and blast, as well as straighthead.

Table 2. Agronomic Characteristics and Yields of Recommended Clearfield Rice Varieties (2014-2016) in Louisiana.

Variety	Grain Type	Seedling Vigor	Lodging	Days to 50% Heading	Plant Height (inches)	Milling % (Whole - Total)				Grain Yield			
						2014	2015	2016	Mean*	2014	2015	2016	Mean*
Long Grain													
CL111	L	G	MR	77	36	70-76	69-77	69-75	67-75	8491	6744	7707	7543
CL151	L	G	S	80	36	70-76	57-74	67-74	62-74	9436	7593	8404	8355
CL152	L	G	R	83	37	72-77	52-73	63-72	60-73	8257	6986	6889	7292
CL153	L	G	MR	81	37	66-73	64-75	67-73	65-73	9128	6465	7978	8133
CLXL729	L	VG	S	79	40	64-72	64-76	62-73	63-74	9901	9688	9698	9748
CLXL745	L	VG	S	77	41	66-73	66-77	64-73	65-75	10145	9434	10738	9801
Medium Grain													
CL271	M	G	MS	83	35	72-75	50-72	67-70	62-72	8932	7752	8145	8249
CL272	M	G	MS	84	38	67-71	42-73	67-70	55-71	9855	7874	8402	8578

* Mean is the average of 16 yield trials conducted over the three-year period. Mean is not the average of the three years (2014-2016), since there were different numbers of trials each year.
Height: Height at maturity in inches from soil line to extended panicle.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant will lodge, especially under excessive levels of nitrogen.
Abbreviations: R = resistant, MR = moderately resistant, MS = moderately susceptible, VG = very good, G = good.

CLXL745 (RiceTec): a very high-yielding, long-grain hybrid with resistance to Newpath herbicide for use in the Clearfield production system. CLXL745 has excellent grain yield and good milling quality. Efforts, however, should be made to harvest at optimum grain moisture (18-20 percent) to minimize milling yield reductions. This hybrid has a good disease package and is moderately resistant to sheath blight and blast, as well as straighthead disorder. This hybrid also appears to have somewhat more resistance to grain shattering at maturity.

Cocodrie (LA): a very early, semidwarf, long-grain variety that has displayed excellent yield potential. It is about the same height as Cypress but has displayed better resistance to lodging. Cocodrie averages two to three fewer days to 50 percent heading than Cypress. It has displayed good second crop potential, good milling quality, and fair seedling vigor. It is susceptible to sheath blight and straighthead and moderately susceptible to blast disease.

Cypress (LA): a semidwarf, long-grain variety that may be more susceptible to lodging than Cocodrie. It has good yield potential and excellent grain quality. Cypress also displays better milling yield stability than most varieties, which allows it to maintain high whole-grain milling yields at lower harvest moisture. The variety also has excellent seedling vigor and very good second crop potential. Cypress is susceptible to sheath blight and blast but displays fairly good resistance to physiological straighthead.

Della-2 (LA): an early maturing, short stature, aromatic, long-grain variety with good grain and milling yields and excellent grain quality. Della-2 has comparable grain quality and aroma to Della but much higher yield potential. The variety is comparable in height and maturity to Cheniere and has shown good resistance to lodging. Della-2 is susceptible to sheath blight, moderately resistant to blast and moderately susceptible to bacterial panicle blight. The variety has shown good ratoon potential in limited testing.

Diamond (AR): a conventional height, early long-grain rice variety. It has good yield potential but has shown somewhat lower head rice yields than other currently grown long-grain rice lines. Diamond is similar in maturity to Cheniere and Mermentau and about 4 inches taller than these two varieties. The variety has shown good seedling vigor and second crop potential in limited testing.

Gemini 214 CL (RiceTec): an early, Clearfield hybrid with excellent yield and fair milling quality. Gemini 214 CL is very similar to XL723 in appearance and performance with improved grain retention. It is resistant to blast and moderately resistant to narrow brown leaf spot and bacterial panicle blight, making it a good candidate for ratoon cropping.

Jazzman (LA): a Jasmine-type, aromatic, long-grain variety. Jazzman has good yield potential and good milling quality. Its aroma, flavor and soft-cooking characteristics are similar to that of imported Thai Jasmine. Jazzman is similar to Wells in plant height and maturity. It is moderately susceptible to sheath blight, straighthead and lodging but moderately resistant to blast.

Jazzman-2 (LA): an early maturing, semidwarf, Jasmine-type, aromatic, long-grain variety. It has good yield potential, good lodging tolerance and very good milling quality. Jazzman-2 has typical Jasmine rice quality characteristics found in imported Thai Jasmine, which

Table 3. Agronomic Characteristics and Yields of Recommended Specialty Rice Varieties (2014-2016) in Louisiana.

Variety	Grain Type	Seedling Vigor	Lodging	Days to 50% Heading	Plant Height (inches)	Milling % (Whole - Total)				Grain Yield			
						2014	2015	2016	Mean*	2014	2015	2016	Mean*
Specialty													
Della-2	L	G	MR	85	40	64-72	56-73	65-72	61-72	7980	6639	6990	7197
Jazzman	L	G	MS	86	37	66-74	62-74	64-72	61-72	8065	6814	6958	7195
Jazzman-2	L	G	MR	82	33	72-76	72-75	69-73	71-74	6508	5883	6725	6330

* Mean is the average of 16 yield trials conducted over the three-year period. Mean is not the average of the three years (2014-2016), since there were different numbers of trials each year.
Height: Height at maturity in inches from soil line to extended panicle.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant will lodge, especially under excessive levels of nitrogen.
Abbreviations: R = resistant, MR = moderately resistant, MS = moderately susceptible, VG = very good, G = good.

include soft-cooking, glassy appearance, sweet flavor and very strong aroma. Jazzman-2 is similar to Cocodrie in height and maturity but about 4 inches shorter and four days earlier than Jazzman. Jazzman-2 is very susceptible to sheath blight, susceptible to bacterial panicle blight and straighthead, but is resistant to blast.

Jupiter (LA): a very high-yielding, semidwarf, medium-grain variety. It has consistently out-yielded Bengal by several hundred pounds per acre. Compared with Bengal, Jupiter has improved resistance to panicle blight, sheath blight and straighthead. It has shown good seedling vigor and milling quality. The grain size of Jupiter is somewhat smaller than that of Bengal.

LaKast (AR): a conventional height, very early, long-grain variety with very high yield potential that was developed in Arkansas. The variety has shown good milling quality characteristics in limited evaluation in Louisiana. LaKast is 4 to 5 inches taller than Louisiana semidwarfs and appears to be moderately susceptible to lodging. It is moderately susceptible to *Cercospera* and straighthead and susceptible to blast, sheath blight and bacterial panicle blight.

Mermentau (LA): an early maturing, long-grain rice variety with good grain and milling yields as well as good grain quality. The variety has displayed grain yields comparable to Cocodrie and Cheniere. Mermentau is rated as susceptible to sheath blight, moderately resistant to blast and moderately susceptible to bacterial panicle blight. The variety is similar in maturity and height to Cocodrie and Cheniere and has displayed good resistance to lodging under most conditions. Mermentau has shown good seedling vigor and ratoon crop potential.

Presidio (TX): a semidwarf, long-grain variety that has good yield potential. It has displayed excellent milling and grain quality. It has good resistance to lodging and has excellent ratoon potential.

Roy J (AR): a conventional height, long-grain variety averaging 2 inches taller than Wells in Louisiana testing. Roy J is rated as susceptible to lodging and straighthead disorder. It has shown excellent yield potential but only fair milling yields.

Titan (AR): a very early, short stature, medium-grain rice variety that has shown excellent yield potential and good milling quality. The variety has consistently shown comparable or slightly better yield potential than CL272 and Jupiter. Titan is similar in height and four days earlier than CL272 in maturity. However, harvest maturity is similar for the three varieties.

XP753 (RiceTec): a very high-yielding, long-grain hybrid that is similar to XL723 in many aspects. It has better grain retention than XL723 but should be harvested at 18-20 percent moisture to maximize grain quality and retention. It is NOT a Clearfield hybrid and, thus, is NOT tolerant of Newpath or Beyond herbicides.

XP760 (RiceTec): a very high-yielding, long-grain hybrid that is similar to XP753. The hybrid has a good disease package and is moderately resistant to sheath blight and resistant to blast. An effort should be made to harvest at optimum grain moisture (18-20 percent) to minimize milling yield reductions. It is NOT a Clearfield hybrid and, thus, is NOT tolerant of Newpath or Beyond herbicides.

Please see Tables 1-3 for the agronomic characteristics and yields of the recommended varieties and Table 4 for the results of variety trials.

Seeding Dates

Because environmental conditions vary in different locations and years, the optimum seeding time is typically presented as a range of dates. Rice yields may be reduced by planting too early or too late outside of the recommended range. Average daily temperature at seeding, calculated by adding the daily high and low temperatures and dividing by 2, is crucial in stand establishment.

Remember: At or below 50 degrees F, rice seed germination is negligible. From 50-55 degrees F germination increases, but not to any great extent until temperature is above 60 degrees F. Seedling survival is not satisfactory until the average daily temperature is above 65 degrees F.

Based on information from seeding date research trials, the optimum planting dates for rice are:

Southwest Louisiana – March 10 to April 15

North Louisiana – April 1 to May 5

Extremely early seeding can lead to a number of problems including:

1. Slow emergence and poor growth under colder conditions because of the inherent lack of seedling vigor and cold-tolerance in many varieties.
2. Increased damage from seedling diseases under cool conditions.
3. Increased damage from birds (blackbirds, ducks and geese), which are more numerous in early spring.
4. Interactions with herbicides.

Extremely late seedings also can be detrimental to yield. Stand establishment can be equally difficult in hot weather. The yield potential of many varieties will decrease significantly with later seedings. Bacterial panicle blight is

Table 4. Results of the 2016 Louisiana Rice Variety Trials.

Entry	Grain Type	Days to 50% Heading	Plant Height (inches)	Milling %* Whole-Total	LDG	Locations**					MEAN*
						RRS	AD	EV	JD	ST. L	
Long Grain											
Catahoula	L	79	39	66-74	MR	9171	7084	9006	8648	7884	8358
Cheniere	L	79	37	63-72	MR	8708	6885	8368	7986	7739	7937
CL111	L	75	38	69-75	MR	8959	5990	8482	8013	7090	7707
CL151	L	79	39	67-74	S	9465	6166	9342	8707	8338	8404
CL152	L	82	40	63-72	MR	8148	4136	7990	8082	6088	6889
CL153	L	78	38	67-73	MR	8834	7518	8829	8014	6693	7978
CL163	L	80	39	61-72	MR	8245	5730	8311	7679	5430	7079
CL172	L	77	37	64-72	MS	8875	7503	8561	8243	7137	8064
CLXL729	L	77	42	62-73	S	10435	7187	11056	9599	10214	9698
CLXL745	L	75	45	64-73	S	10516	10179	9871	10209	9059	9967
Cocodrie	L	80	39	63-73	MR	7788	5847	7154	6716	7197	6940
Cypress	L	81	37	68-73	MS	7423	5596	7560	7166	6742	6898
Diamond	L	78	41	50-72	MS	9202	6206	9314	7620	7679	8004
Gemini 214 CL	L	80	47	60-71	S	11771	10747	11754	10051	10466	10958
LaKast	L	77	41	55-73	MS	9807	7652	9102	7832	8016	8482
Mermentau	L	77	37	60-72	MR	8691	6292	9072	8095	7417	7913
Presidio	L	77	39	65-73	MR	7578	6390	7586	7324	7016	7179
Roy J	L	83	42	54-72	MR	8330	5639	9218	8412	6397	7599
XP753	L	76	43	66-74	S	11334	10584	11212	10040	10522	10738
XP760	L	80	47	57-71	S	9805	9775	11759	9379	9902	10124
Specialty Grain											
Della-2	L	83	41	65-72	MR	7571	6085	7646	7916	6990	7242
Jazzman	L	85	39	64-72	MR	8177	5293	7883	7318	6116	6958
Jazzman-2	L	78	35	69-73	MR	7177	5517	7494	7224	6214	6725
Medium Grain											
Caffey	M	82	37	66-70	MS	9496	6698	9204	7569	6478	7889
CL271	M	82	37	67-70	MS	8559	6791	9248	8531	7594	8145
CL272	M	81	37	67-70	MS	9186	7188	9342	8625	7668	8402
Jupiter	M	82	37	66-68	MS	8672	7497	9637	8545	7192	8308
Titan	M	77	38	67-69	MS	8900	7464	10031	9191	7708	8659

* Milling data - average of RRS and EV.

** RRS = H. Rouse Caffey Rice Research Station; AD = Acadia Parish, R&Z Farm; EV = Evangeline Parish, Beiber Farm; JD = Jefferson Davis Parish, Hoppe Farm; ST.L = St. Landry Parish, Sunland Properties.

thought to be associated with higher-than-normal day and night temperatures during pollination and grain fill. Late-planted rice is more likely to encounter these conditions. Also, many diseases (especially blast) and insect problems are more severe, and grain quality is often decreased with later-seeded rice. To assure adequate time for a ratoon or second crop to develop prior to the onset of cold weather, the first crop should be harvested before mid-August. Rice planted by or before April 15 in southwest Louisiana has the most potential for meeting this harvest deadline and producing good grain yields in the ratoon crop.

Seeding Rates

Establishing a satisfactory stand is an essential first step in a successful rice production program. The amount of seed necessary to accomplish this depends primarily on the type of seeding system (dry- or water-seeded).

Rice in Louisiana is planted in three basic ways: water-seeded (dry or presprouted seed dropped into a flooded field); drill-seeded (planted with a drill on 7- to 10-inch rows); and broadcast dry (broadcast on a dry seedbed by either ground equipment or airplane).

Regardless of the seeding system used, the desired plant stand is identical. The optimum stand is 10 to15 plants per square foot; the minimum stand is six to eight plants per square foot. Rice (like most grasses) has the ability to tiller or stool. This is why a somewhat satisfactory stand can be produced from as few as six to eight seedlings per square foot if proper cultural practices are used. Stands can be too thick as well as too thin. Excessively thick stands can often lead to increased disease pressure as well as spindly plants that may be susceptible to lodging.

Experimental results and commercial experience have shown that different seeding rates are often necessary to reach these desired stands, depending on the type of seeding system used. For this reason, planting on the basis of seeds per acre to obtain the desired plant population is more accurate than planting pounds per acre. For example, 90 pounds of Caffey will contain fewer seeds than 90 pounds of CL151. For conventional varieties, an ideal plant population is approximately 10 to15 plants per square foot. Seeding rates of hybrids are much lower than inbred varieties. Growers should consult the hybrid seed representative for guidelines and recommended seeding rates.

Under typical conditions, in a drill-seeded system, about half of the seeds survive to produce a plant. Therefore, if the target rice stand is 10-15 plants per square foot, approximately 20-30 seeds per square foot will have to be planted. Use the information in Table 5 to determine the pounds of seed per acre required to achieve the desired plant population.

When water-seeding or dry broadcasting, about 80-120 pounds of seed per acre are required. When drill seeding, about 50-80 pounds of seed per acre are required. Refer to the plant growth regulator section for recommendations on reduced drill seeding rates when using seed treated with gibberellic acid. Use the higher rates when planting under less than optimum conditions.

Considerations include:

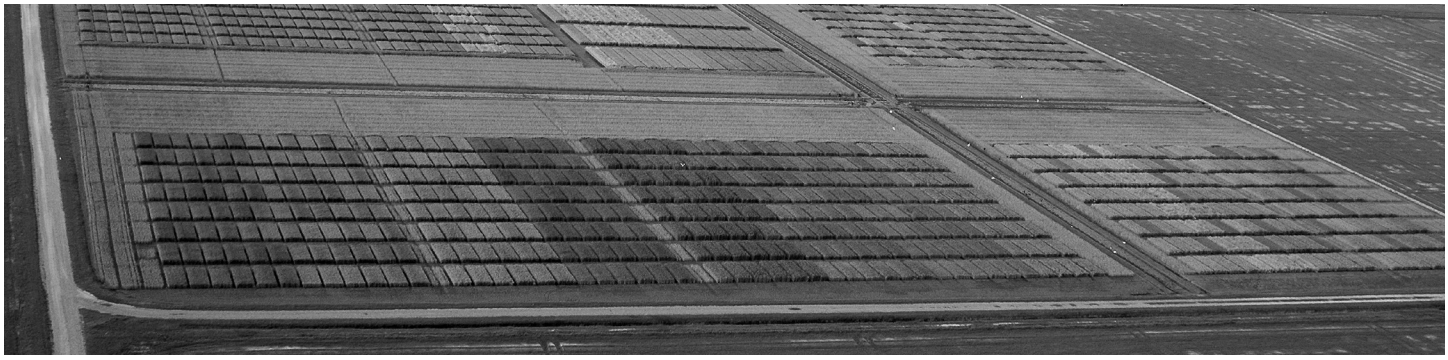
a. Use higher seeding rates when planting early in the season when there is potential for unfavorably cool growing conditions. Cool conditions will favor seedling diseases. This can reduce stands. Varieties also differ in tolerance to cool growing conditions in the seedling stage.
b. Varieties differ considerably in average seed weight. Thus, a variety with a lower average seed weight will have more seed per pound. Table 5 shows seed weight per pound and the average number of seed per square foot at several seeding rates for most of the varieties mentioned in this publication. Producers may want to adjust seeding rates for this factor.
c. Where seed depredation by blackbirds is potentially high, use a higher seeding rate.
d. Where seedbed preparation is difficult and a less than optimum seedbed is prepared, use a higher seeding rate.
e. If it is necessary to use seed of low-germination percentage, compensate with increased seeding rates. Always use high-germination, certified seed if possible.
f. When water-seeding into stale or no-till seedbeds with excessive vegetation, use higher seeding rates.
g. If any other factor exists that may cause stand establishment problems (such as slow flushing capability or saltwater problems), consider this when selecting a seeding rate.
h. Water-seeding research has shown that the best stands are obtained when planting pre-sprouted seeds. Presprouted seed typically will lead to better stands than dry (non-presprouted) seeds.

Plant Growth Regulators

Seed treatment with gibberellic acid promotes rapid, uniform emergence in dry-seeded systems. It is especially effective on semidwarf varieties. With gibberellic acid, seeding depth can be increased to ensure seed placement into soil moisture adequate for germination and emergence to minimize flushing, but the depth should not be more than 1.5 inches. In drill-seeded rice, the seeding rate can be decreased to 50-80 pounds per acre when planting under warm conditions (daily average temperature higher than 70 degrees F). Under cool conditions (daily average temperature of 60-70 degrees F), the higher rates are recommended.

Table 5. Seed per Pound and Average Number of Seed per Square Foot for Important Rice Varieties.													
Variety	**Seed/lb***	**Seeding Rate (lb/A)**											
		20	25	30	40	50	60	70	80	90	100	110	120
		----------seed/ft^2----------											
Caffey	15,724				14	18	22	25	29	32	36	40	43
Catahoula	18,460				17	21	25	30	34	38	42	47	51
Cheniere	19,691				18	23	27	32	36	41	45	50	54
CL111	18,102				17	21	25	29	33	37	42	46	50
CL151	19,461				18	22	27	31	36	40	45	49	54
CL152	21,172				19	24	29	34	39	44	49	53	58
CL153	18,047				17	21	25	29	33	37	41	46	50
CL163	18,533				17	21	26	30	34	38	43	47	51
CL172	18,486				17	21	25	30	34	38	42	47	51
CL271	17,497				16	20	24	28	32	36	40	44	48
CL272	16,745				15	19	23	27	31	35	38	42	46
CLXL729	20,601	9	12	14									
CLXL745	19,732	9	11	14									
Cocodrie	19,014				17	22	26	31	35	39	44	48	52
Cypress	19,096				18	22	26	31	35	39	44	48	53
Della-2	17,693				16	20	24	28	32	37	41	45	49
Diamond	19,086				18	22	26	31	35	39	44	48	53
Gemini 214 CL	20,011	9	11	14									
Jazzman	18,104				17	21	25	29	33	37	42	46	50
Jazzman-2	19,861				18	23	27	32	36	41	46	50	55
Jupiter	17,320				16	20	24	28	32	36	40	44	48
LaKast	18,015				17	21	25	29	33	37	41	45	50
Mermentau	19,725				18	23	27	32	36	41	45	50	54
Presidio	18,839				17	22	26	30	35	39	43	48	52
Roy J	19,113				18	22	26	31	35	39	44	48	53
Titan	16,330				15	19	22	26	30	34	37	41	45
XP753	20,704	10	12	14									
XP760	20,837	10	12	14									

*Average seed weights are determined from multiple seed sources and years.



Rice Fertilization

Fertilizer nutrients are most efficiently used by rice when applied immediately before planting until before the rice reaches the 4-leaf stage of development. A fall application of some nutrients may be a suitable alternative in some situations. Neither nitrogen (N) nor zinc (Zn), however, should be applied in the fall. For more details, consult the Louisiana Rice Production Handbook, publication 2321.

Phosphorus (P) and potassium (K) should be applied according to soil test recommendations. On soils where P and K are needed, apply fertilizer preplant or before rice reaches the 4-leaf stage of development. Currently, soil test-based fertilizer recommendations (Tables A to D) only address main rice crop needs and do not address ratoon rice needs. Recent research has shown that rice grown on soils that test very low, low or medium in soil test P and/or K will need an additional 30 pounds of P (as P_2O_5) and/or K (as K_2O) to maximize ratoon yields. The additional P and K fertilizer can be applied with P and K in the first crop or can be applied after first crop harvest.

Generally, lime is not recommended for rice production unless the pH of the soil is 5.4 or lower. Crops grown in rotation with rice, such as cotton, soybeans and other pH sensitive crops, may benefit from liming. The pH of the soil should not be increased to more than 6.2 for rice production. Over liming can induce Zn deficiency in rice. Lime should be applied in the fall after rice harvest.

In a water-seeded pinpoint flood system, a third of the crop's N fertilizer needs should be applied during the brief drain period between planting and reflooding. If urea is the fertilizer source, it should be treated with a urease inhibitor product containing the active ingredient N-(n-butyl) thiophosphoric triamide (NBPT). The second third of the N fertilizer should be applied one to two weeks later and the final third by internode elongation (green ring). In a drill-seeded, dry broadcast or water-seeded, delayed flood system, two thirds of the N should be applied immediately before permanent flood. To maximize N efficiency, the application should be made on dry ground and flooded as soon as possible after the application. The balance of the N should be applied when at internode elongation (green ring) or earlier if deficiency symptoms occur.

Nitrogen fertilizer applied as urea is prone to loss through ammonia volatilization. A urease inhibitor, which contains the active ingredient NBPT can be applied to the surface of urea fertilizer to slow down its breakdown and reduce ammonia volatilization.

Use of a urease inhibitor is recommended to reduce volatilization losses when applied urea is expected to remain on the soil surface for longer than three days prior to flood establishment or if the soil is moist (without standing water) prior to application. It is not recommended if urea is applied into standing water.

The recommended seasonal N rates as determined by rice variety grown are presented in Table 6. Rice varieties may differ in their N requirements by location. Native soil fertility, soil type and other factors effect N efficiency. Rice growers should determine the N rate that provides optimum grain yield on their soil. The higher N rates within the recommended range for each variety are generally required on clay soils in central and northeast Louisiana. Avoid N deficiency and excessive N fertilization.

Zinc (Zn) deficiency can be a serious problem in rice resulting in greatly reduced yields if not corrected. Currently, if a soil has less than 1 ppm of extractable Zn using the Mehlich-3 soil test, it is considered deficient in Zn. Soil pH is important in determining the potential for Zn deficiency in rice because, as soil pH increases above 6, the solubility of Zn begins to decrease. This relationship can cause Zn to become unavailable for plant uptake even when soil test levels exceed 1 ppm. Therefore, both soil pH and the Mehlich-3 soil test are used to determine Zn fertilizer needs in rice. See Table D for Zn fertilizer recommendations. Zinc fertilizer recommendations are based on using a granular zinc sulfate. Other Zn sources can be used; however, inorganic Zn sources should be greater than 50 percent water soluble. Liquid inorganic or chelated Zn fertilizers can be soil applied at lower rates as compared with granular sources, generally between 2.5-5.0 pounds, since they can be applied more uniformly. When Zn deficiency symptoms begin to occur (bronzing), it is recommended to immediately drain the field. When the rice begins to show signs of recovery (new growth), a foliar Zn application can be applied to rice at rates between 1 and 2 pounds of Zn per acre. Granular Zn applications at this time have also shown to be equally effective. Application of N fertilizer should also be applied prior to reflooding to account for the N losses associated with draining. Ammonium sulfate is generally the preferred N source in this situation.

Sulfur (S) may be needed at a rate of 20-25 pounds per acre where large amounts of soil have been moved in land leveling. Sulfur deficiencies resemble N deficiencies, producing pale yellow plants which grow slowly. Sulfur deficiency symptoms in rice generally appear beginning with the newest leaf becoming yellow first, while N deficiency symptoms appear first in the lowest (oldest) leaves. If these symptoms appear, applying 100 pounds of ammonium sulfate per acre will provide 21 pounds of N and 24 pounds of S per acre.

Table 6. Nitrogen Recommendations for Rice Varieties.

Varieties	N rate (lb/A)
Caffey, Catahoula, Cheniere, CL111, CL152, CL163, CL271, Cocodrie, Cypress, Della-2, Jazzman, Jazzman-2, LaKast, Mermentau, Presidio, Roy J	120-160
CL151, Jupiter	90-130

LSU AgCenter Soil Testing Tables

Soil testing is a useful tool in assessing the soil fertility status and determining fertilizer application rates. Currently, the LSU AgCenter Soil Testing and Plant Analysis Laboratory uses the Mehlich-3 soil test extraction for phosphorus (P), potassium (K), sulfur (S) and zinc (Zn), the most commonly deficient nutrients in commercial rice production in Louisiana. Mehlich-3 soil test based recommendation tables for P, K, S and Zn are included below as a reference. Generally, if your soil test results fall into the very low, low or medium categories, fertilizer applications would be recommended to increase rice yields. Recommendation tables do not include ratoon rice needs. Recent research has shown that rice grown on soils that test very low, low or medium in soil test P or K may need an additional 30 pounds of P_2O_5 and K_2O fertilizer to maximize ratoon yields. The additional P and K can be applied with first crop fertilization or after the main crop harvest.

Table A. Potassium Fertilizer Recommendations and Soil Test Ratings Based on the Mehlich-3 Soil Test Extraction.

Soil Type	Texture	Very Low	Low	Medium	High	Very High
		ppm				
Alluvial						
	clay, silty clay	<114	114 - 182	183 - 227	228 - 273	>273
	clay loam, silty clay loam	<91	91 - 136	137 - 182	183 - 205	>205
	loam and silt loam	<57	57 - 91	92 - 136	137 - 159	>159
	sandy loam	<45	45 - 80	81 - 114	115 - 136	>136
Upland						
	clay, silty clay	<114	114 - 182	183 - 227	228 - 250	>250
	clay loam, silty clay loam	<57	57 - 102	103 - 148	149 - 170	>170
	loam and silt loam	<57	57 - 91	92 - 136	137 - 159	>159
	sandy loam	<45	45 - 80	81 - 114	115 - 136	>136
Fertilizer Recommendation		lb K_2O / A				
		60	40	20	0	0

Table B. Phosphorus Fertilizer Recommendations and Soil Test Ratings Based on the Mehlich-3 Soil Test Extraction.

Soil Test Ratings	Very Low	Low	Medium	High
	ppm			
	<10	11 - 20	21 - 35	≥36
Fertilizer Recommendation	lb P_2O_5 / A			
	60	40	20	0

Table C. Sulfur Fertilizer Recommendations and Soil Test Ratings Based on the Mehlich-3 Soil Test Extraction.

Soil Test Ratings	Low	Medium	High
	ppm		
	<12	12-16	≥16
Fertilizer Recommendation	lb / A		
	40	20	0

*Application of 100 pounds of ammonium sulfate will provide 21 pounds of N and 24 pounds of S.

Table D. Zinc Fertilizer Recommendations and Soil Test Ratings Based on the Mehlich-3 Soil Test Extraction and Current Research on the Effects of pH on Zinc Availability[1].

Soil Test	≤ 1 ppm		1 - 1.5 ppm			1.6 - 2 ppm	
pH	≥ 7	< 7	≥ 7	6.9 - 6.0	< 6	≥ 7	<7
Granular Fertilizer Recommendation[2]	15 lb/A	10 lb/A	10 lb/A	5 lb/A[2]	none	5 lb/A	none

[1] The granular zinc fertilizer source must be at least 50 percent water soluable or higher rates of zinc may be needed.
[2] Even distribution of most granular zinc fertilizer sources at rates of less than 10 pounds per acre is difficult to achieve. It can be achieved, however, when the zinc is premixed with a starter N application using 50-100 pounds of ammonium sulfate.

Ratoon Management

Ratoon, or second-crop rice, should be fertilized with 75-90 pounds of N per acre when first crop harvest is before August 15. When conditions appear favorable for good second crop production (minimal field rutting, little or no red rice, healthy stubble), apply the higher rate of N. Apply N and establish a shallow flood within five days after harvest. Research has consistently shown that N fertilizer should be applied and the field flooded as soon as possible after first crop harvest to maximize second crop yield. When the main crop is not harvested before August 15, the potential for profitable second crop production is reduced because of the probable delay in maturity, especially at higher N rates and the increased likelihood of unfavorable weather. Days to ratoon maturity increase with increasing N fertilization rates. Therefore, when the first crop is not harvested before August 15, lower N rates are recommended. A good rule of thumb is to reduce N by 5 to 6 pounds per day after August 15. Fertilizer N is not recommended after September 1.

As stated in the fertility section, currently LSU AgCenter soil test based P and K recommendations do not consider the ratoon rice crop. Recent research has shown that rice grown on soils that test very low, low or medium in soil test P or K will need an additional 30 pounds of P (as P_2O_5) or K (as K_2O) to maximize ratoon yields. The additional P and K fertilizer can be applied with P and K in the first crop or can be applied after first crop harvest.

Stubble management practices, such as postharvest mowing of the stubble to approximately 8 inches, or postharvest rolling of the stubble, have shown to increase ratoon yields significantly. Additional benefits of postharvest stubble management of the rice straw include even maturity of the grain, reduced incidence of *Cercospora*, and increased grain quality. However, it should be noted that postharvest stubble management practices do delay maturity by approximately two weeks and should be avoided if the main crop is harvested after September 1.

Rice Insects

The major insect pests of rice in Louisiana are the rice water weevil, the rice stink bug and a complex of stem-boring moths. Armyworms, billbugs, chinch bugs, colaspis, rice leafminer, rice seed midges, the South American rice miner and sugarcane beetles can cause crop injury in some years. Under high infestation levels, yield can be reduced by all of these pests. Identification and scouting information for these pests is presented. More detailed descriptions can be found in the LSU AgCenter Louisiana Rice Production Handbook, publication 2321. Information about these pests is also available on the Rice Scout Smartphone app. If you suspect insect injury in your field(s), contact your county agent for verification and help with damage assessment and insect management.

Rice Water Weevil

Adults are grayish-brown (1/8-inch long x 1/16-inch wide) beetles that fly into rice fields to feed on the leaves of rice plants. Leaf feeding by adults causes narrow scars that run lengthwise on the leaf, but this feeding rarely causes economic damage. Females lay eggs in the leaf sheath at or below the water line, primarily after permanent flood is applied. The larvae are white, legless grubs with brown heads that feed on the roots, reducing rice yields. Four instars vary in size from 1/32 inch to 3/16 inch.

Although application of insecticides remains the primary means of controlling or preventing rice water weevil infestations, other practices can significantly reduce the impact of rice water weevils on rice yields. One key to developing an effective management program for this insect is to remember that heavy infestations of the damaging stage (the root-feeding larval stage) will not begin until water is applied to the field. Because water-seeded rice is typically flooded at a younger, more susceptible stage of growth, yield losses due to the rice water weevil tend to be higher in water-seeded rice. Delaying application of permanent flood to rice can reduce yield losses from weevils but may not be compatible with other agronomic practices, particularly weed control. Another key to managing this insect is early planting of rice. Early planting facilitates weevil management in three ways. First, weevil infestations tend to be less severe in rice planted in mid- to late March than in later-planted rice because emergence of adults from overwintering sites does not begin until early April and is not complete until May. Second, yield losses from weevil feeding tend to be lower in early-planted rice than in late-planted rice. Third, single applications of pyrethroids are less effective in late-planted rice than in early-planted rice.

Seeding rice at low rates (e.g., 20-50 pounds per acre in drill-seeded rice) can make rice more susceptible to infestation and yield losses from the rice water weevil. All currently grown rice varieties and hybrids are susceptible to the rice water weevil. Recent research, however, indicates some differences in susceptibility. For example, medium-grain varieties appear to be more susceptible to infestation than long-grain varieties. Nonetheless, no commercially available varieties possess high enough levels of resistance to eliminate the need for insecticides.

Management of the rice water weevil with seed treatments: Dermacor X-100, CruiserMaxx, and NipsIt INSIDE are insecticidal seed treatments that are applied by the seed dealer. Seed treated with Dermacor X-100 may be used in either dry- or water-seeding practices. CruiserMaxx and NipsIt INSIDE can only be used in rice that is drilled into a dry seedbed. The main target of these insecticides is the rice water weevil. Generally, populations of rice water weevil in southwest Louisiana are high enough that seed treatments are warranted in most fields. Aside from rice water weevils, these seed treatments control different types of insects. Dermacor X-100 will effectively control fall armyworms and will suppress injury

from stem borers later in the season. CruiserMaxx and NipsIt INSIDE will control colaspis larvae and chinch bugs. If these seed treatments are used, there is little need to scout for rice water weevil adults because they are preventative treatments. However, there are some instances when adult rice water weevil feeding injury can be so severe that application of a pyrethroid is necessary to prevent dehydration and death of seedlings. See the label for restrictions concerning crawfish production where seed treatments are used.

Data from small-plot research as well as some data from commercial trials indicate seeding at low rates (30 to 50 lb seed per acre) compromises the effectiveness of seed treatments, particularly CruiserMaxx and NipsIt INSIDE. If CruiserMaxx or NipsIt INSIDE are used in fields seeded at low rates, additional management practices should be considered, such as early planting or treating fields with pyrethroids or Belay, if heavy infestations of rice water weevil adults are found.

Management of the rice water weevil with foliar applications of pyrethroid or neonicotinoid insecticides: Declare, Fastac, Karate, Mustang Max and Prolex are insecticides with similar characteristics. Trebon (etofenprox) is a granular insecticide; the chemistry of which is similar to the pyrethroids. Belay is an insecticide that belongs to the neonicotinoid class of insecticides. All of these insecticides only kill adult weevils, so timing of insecticide application is crucial for management. The pyrethroids are extremely toxic to crawfish, and drift into crawfish ponds must be avoided. Belay is also toxic to crawfish; however, the acute toxicity of Belay is much lower than the toxicity of the pyrethroids.

Scouting for adult weevils is important and may begin at any time after emergence of rice, but efficacy of these insecticides is maximized when adults are controlled just before oviposition (egg laying). Oviposition is possible when the field has been saturated by rainfall or flushing or when permanent flood has been established. In most fields, the majority of oviposition is likely to occur after the establishment of permanent flood. Check at least five to 10 locations per field for the presence of adults or their feeding scars. Treat when adult weevils or their scars are observed and conditions for egg laying are favorable as described above. Applications made up to 24 hours before initiation of permanent flood can be effective when adults are present; pre-flood applications appear to be more effective than post-flood applications for Belay. Tebon should not be applied pre-flood because of the concerns about movement of the Trebon granules in the flood water. More than one application of pyrethroids may be required. Once fields have been treated, begin sampling again after seven days. All foliar insecticides have the ability to kill adult weevils but not eggs and larvae. Egg laying (oviposition) must be prevented. Once eggs are laid in rice stems or larvae are in the roots, these insecticides will not be effective. Applications of them for eggs or larvae are a waste of money in addition to the loss caused by weevils.

Adult rice water weevil

Rice Stink Bug

These tan and golden bugs (about 1/2-inch long) feed on rice when it begins to head. Females lay light green, cylinder-shaped eggs in two-row clusters on leaves, stems and panicles. Eggs turn red-black just before larval emergence. Nymphs (immatures) are black with red marks on the abdomen. Older nymphs resemble adults. Nymphs and adults feed on the rice florets and suck the sap from developing rice grains. Feeding on florets and on grains in the early milk stage can reduce rough rice yields; however, most economic losses arises from reduction in grain quality that results from stink bugs feeding on developing kernels. Pathogens enter the grain at the feeding spot, and the pathogen infection and bug feeding together cause discolored and pecky rice kernels. Discolored or pecky rice kernels have lower grade and poor milling quality. To scout for rice stink bugs in the field, use a 15-inch diameter sweep net and take 10 sweeps at 10 different areas around each field. Count the number of mature and immature bugs collected after every 10 sweeps. In the first two weeks of heading, treat fields when there are 30 or more bugs per 100 sweeps. Pesticides that can be used include a variety of pyrethroids, such as Karate Z, Mustang Max and Prolex. The neonicotinoid, Tenchu, can also be used, but this insecticide cannot

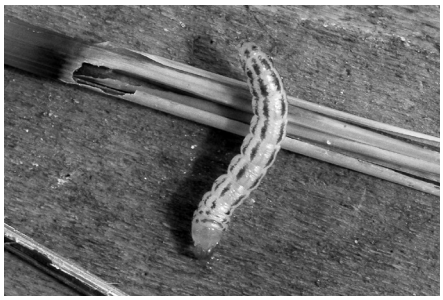
Rice stink bug nymph

Adult stink bug

be applied when rice is flowering because of potential effects on bees. From the dough stage until two weeks before harvest, treat fields when there are 100 bugs per100 sweeps. When approaching two weeks before harvest, you can treat with any of the chemicals listed above with the exception of Karate Z and Prolex, which have 21-day preharvest intervals.

Rice Stem Borers

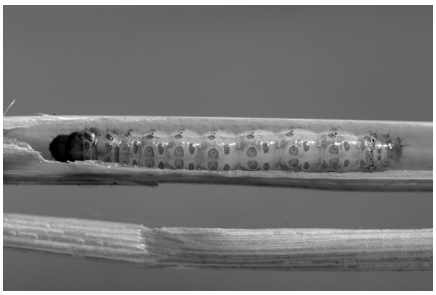
The sugarcane borer, rice stalk borer and Mexican rice borer are important pests of rice in some regions in Louisiana. Of these three species, the sugarcane borer is the most aggressive and economically important in some central and northeastern Louisiana rice areas. The sugarcane borer and the rice stalk borer are distributed statewide. The Mexican rice borer has now invaded all rice-producing parishes in southwest Louisiana. All borer species overwinter as last instar larvae in the stalks of rice and other host plants. These larvae pupate in the spring, and adult moths emerge during early May. Detailed descriptions of the identification, biology and behavior of the borers that infest Louisiana rice can be found in the Louisiana Rice Production Handbook, publication 2321. Briefly, adult borers are light tan to tan in color with distinct markings on the wings that differentiate the species. Borer egg-laying on rice can begin as early as May, but economically damaging infestations generally do not occur until July or September when rice is in its reproductive stages. The appearance of eggs varies depending on the species. Sugarcane borer eggs are flat, oval, cream-colored and positioned like fish scales in clusters of two to 100 eggs. Mexican rice borer eggs are laid in clusters on dead and dying tissue on the plant. Larvae emerge within four to five days of egg-laying. Young larvae crawl to the base of the leaf while feeding on the leaf surface, followed by feeding on the inside of the leaf sheath. Depending on the species, larvae will bore into the stem from one to seven days after emergence. They will then continue to feed within the stem for three or four weeks. Mature larvae of all borer species may reach 1 inch in length. Larvae of the sugarcane borer are cream-colored, with a series of brown spots on the back. Larvae of the rice stalk borer are cream-colored but lack the brown spots on the back. Instead, they have two pairs of dark stripes running the entire length of the body. Mexican rice borer larvae are white to honey-colored with a pair of dark brown to purple-colored discontinuous stripes running the length of the body.



Mexican rice borer larva

Pupation occurs inside the stem. The pupae are brown, about 1/2-inch long and cylindrical. The pupal stage lasts seven to 10 days. Early infestations by borers are noticed when the youngest partially unfurled leaf of the rice plant begins to wither and die, resulting in a condition called deadheart. Stem feeding that occurs during panicle development causes partial or complete sterility and results in the whitehead condition. Severe infestations cause stalk breakage and plant lodging above the water surface.

Scouting for borers should start at green ring and must be intensified as plants reach early boot stages. Scouts should look for feeding lesions on the inside surface of the leaf sheath. These lesions are caused by the larva that feeds underneath the leaf sheath during the brief period before it bores into the stem. These feeding lesions are easily observed from the outside. Care must be taken, however, to avoid confusing these lesions with those caused by sheath blight. Peel back the leaf sheath to expose the feeding larva or to detect the presence of frass to ensure it is stem borer and not sheath blight damage. In addition, scouts must look for adults and egg masses. The insecticidal seed treatment Dermacor X-100 has been shown to provide a moderate level of control of stem borers. Use of this product is recommended where rice water weevils are a problem, and problems with stem borers are anticipated. Applications of foliar insecticides later in the season must coincide with larval emergence so small larvae are killed before they enter the rice stalks or during the time they feed on the inside surface of the leaf sheath. Once larvae enter the stalks, pesticides are not effective. Declare, Karate-Z and Prolex are labeled for stem borer control in rice. No economic thresholds, however, have been developed for these insects in rice.



Sugarcane borer larva

Early planting allows the rice crop to avoid severe infestations of stem borers, especially where populations of the sugarcane borer increase in host plants, such as corn and grain sorghum, and move to rice plants later in the season. Destruction of rice stubble and weed management after harvest will also help in borer management by eliminating overwintering populations.

Rice Seed Midge

Adult midges resemble small mosquitoes and swarm over rice fields, rice levees, roadside ditches and other bodies of water. Elongated eggs are laid on the surface of open water in strings. Larvae live on the bottom of flooded rice fields in spaghetti-like tubes. Larvae injure water-seeded rice by feeding on the embryo of

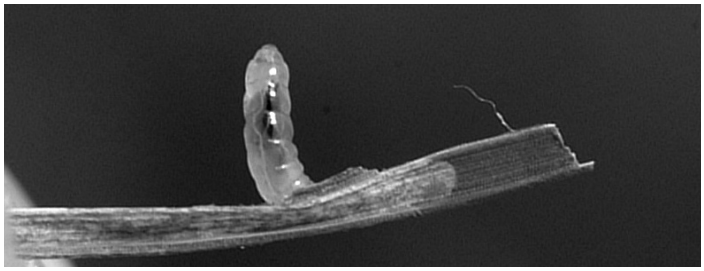
germinating seeds or on the developing roots and seeds of very young seedlings. The potential for midge injury increases when fields are flooded far in advance of water-seeding rice.

Water-seeded fields should be scouted for midge injury, checking for hollowed out seed within five to seven days after seeding. Monitor fields until rice seedlings are several inches tall. Depending on the severity of injury, whole fields may need to be replanted, while in some cases, only a portion of the field may require reseeding.

Control rice seed midge by applying Karate Z, Declare or Prolex if a large number of hollowed out seeds are observed in the first week after planting, or stands are being reduced significantly during the first two weeks after planting (less than 15 plants per square foot).

Rice Leafminer

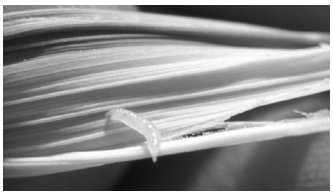
Adult flies are less than 1/4-inch long, with a metallic blue-green to gray thorax and clear wings, and they lay eggs on rice leaves as they lie on the water. The larvae are transparent to cream-colored after hatching but become yellow to light-green within a few days. Larvae injury the plant by tunneling between the layers of the leaf, attacking and killing leaves closest to the water before moving up the plant, killing additional leaves. Under heavy infestations, the entire plant may die. Rice is attacked in the early spring, and infestations usually occur in continuously flooded rice on the upper side of levees where water is deepest. Scout for rice leafminer larvae by pulling a rice leaf gently between the thumb and forefinger feeling for the presence of a bump in the leaf. If a bump is detected, the larvae or pupae can be found by separating the layers of the leaf. If plant populations are being reduced to less than optimum stands (10-15 plants per square foot), chemical control may be necessary.



Leaf pulled back to expose rice leafminer maggot

South American Rice Miner

The South American rice miner (SARM) is a sporadic invasive insect pest of rice in the United States. It is a close relative of the rice leafminer, which is widely distributed across U.S. rice fields. Small, gray flies (about 1/10-inch long) deposit elongate, ribbed, white or creamy-colored eggs (0.5 mm long and 1.2 mm wide) singly on the upper surface of rice leaves, near the leaf margins. Larvae are small, white or yellowish, legless maggots about 1/4-inch long. The brown puparium is elongated and tapered at both ends. Economic injury to rice plants tends to occur in young rice from emergence until the tillering stages. In most years, this insect is more of a problem in late-planted rice, although heavy infestations have been observed in rice planted in March and April in southwest Louisiana. Injury is caused by the larva or maggot, which causes large, elongated lesions along the margins of emerging leaves. As the leaf expands, yellow damaged areas are more visible. Affected young leaves usually break off display a ragged appearance or have a withered tip. The maggot continues to feed on the whorl tissue and enters the stem of developing plants. Affected seedling plants are either killed or plant growth is severely retarded. Pupation occurs inside the affected stem near the collar of the leaf. Field damage is distributed in large patches either in the center or along the margins of the field. If the infestation is not too severe and occurs in the tillering stage, rice appears to be able to tolerate some injury without loss in yield.



South American rice miner

No chemicals are currently registered to control SARM. The only recommendation available at this time is to avoid late planting. If you suspect a SARM infestation, contact your county agent for damage assessment and to obtain the latest developments on this insect pest.

Colaspis

There are two species of colaspis in Louisiana rice: *Colaspis brunnae* and *Colaspis louisianae*. This pest can be found damaging fields of dry-seeded rice in soybean-rice or a pasture-rice crop rotation. It is common to find a clumped distribution of larvae in the soil and patches of stand loss. The damage is often concentrated in high spots in the field. Colaspis will complete a single generation in soybeans and lespedeza. The larvae of colaspis overwinter in the soil. When rice, or another crop, is planted into a field that is infested with colaspis larvae, the larvae will begin to feed on the roots of the rice plant. The larvae pupate in the soil and emerge as adults. Oval-shaped, golden-colored adults have tan stripes running the length of the body and are about 1/4 inch in length with long antennae.

To scout for this pest, locate plants that are stunted, withering, dying and surrounded by declining plants. Dig around the base of the plants, carefully peeling back the soil and looking for white grubs with brown heads that are a little larger than rice water weevil larvae. CruiserMaxx and NipsIt INSIDE seed treatments have shown some ability to control colaspis in drilled rice. When rice is planted following soybeans or pasture, treating seed with CruiserMaxx or NipsIt INSIDE may be justified. No foliar insecticides are labeled to control colaspis in Louisiana rice. Applying permanent flood as soon as possible may help control colaspis. These insects are not aquatic, and application of water will decrease feeding injury and eventually cause death of the larvae.

Fall Armyworm

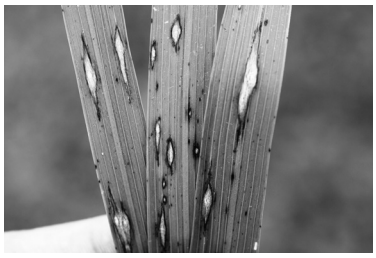
The fall armyworm, *Spodoptera frugiperda* (J. E. Smith), feeds on most grasses found in and around rice fields. It is also a serious pest of corn and pasture grasses. Since rice is not its preferred host, the fall armyworm is only an occasional pest on rice. Adult moths are about 1 inch long with gray-brown sculptured front wings and whitish hind wings. Females lay masses of 50 to several hundred whitish eggs covered with moth scales on the leaves of rice and other grasses in and around rice fields. Light-green, brown or black larvae with white stripes running the length of the body emerge in less than 10 days and then feed on rice plants for two the three weeks. Mature larvae are about 1 inch long and have a distinctive inverted Y on the head. Mature larvae prepare a cocoon and pupate in soil or decomposing plant material. Moths emerge in 10-15 days, mate and disperse widely before laying eggs on new plants.

Larvae feed on the leaves of young rice plants, destroying large amounts of tissue. When large numbers of armyworms are present, seedlings can be pruned to the ground, resulting in severe stand loss. Fall armyworm infestations generally occur along field borders, levees and in high areas of fields where larvae escape drowning. The most injurious infestations occur in fields of seedling rice that are too young to flood. To scout for fall armyworms in young rice, begin scouting after germination of seedlings, and continue to scout fields weekly for the presence of larvae on plants. Sample plants every 10 feet along a line across the field and repeat this process in a second and third area of the field. Treat with pyrethroids when there is an average of one armyworm per two plants. Since adults lay eggs on grasses in and around rice fields, larval infestations can be reduced by effective management of grasses. Cultural control consists of flooding infested fields for a few hours to kill fall armyworm larvae. This requires that levees be in place and that rice plants be large enough to withstand a flood. Parasitic wasps and pathogenic microorganisms frequently reduce armyworm numbers below economical levels. Formulations of *Bacillus thruingiensis* are available, but must be used when caterpillars are small.

Rice Diseases

Since the list of labeled fungicides may change, check with your Cooperative Extension agent for current recommendations. For more information, consult the Louisiana Plant Disease Guide, publication 1802, with a search from the LSU AgCenter home page at www.LSUAgCenter.com, or visit our webpage, www.lsuagcenter.com/topics/crops/rice/diseases.

Fungicide timing is critical for disease control (Table 8). Sheath blight should be treated between early boot (2- to 4-inch panicle) and heading growth stage but not beyond percent of heads emerging (any part of the head exposed). Blast must be treated at the 50-70 percent heading growth stage. Kernel smut must be treated at mid-boot growth stage (4- to 6-inch panicle in the boot) for best activity. Yield and grain quality increase with disease control but quickly decrease if fungicides are applied after 70 percent heading. Remember, growth stages are very hard to detect and anticipate, so it is important to scout for the rice growth stage at the same time you scout for disease.



Leaf blast

Node blast

Collar blast

Rotten-neck blast

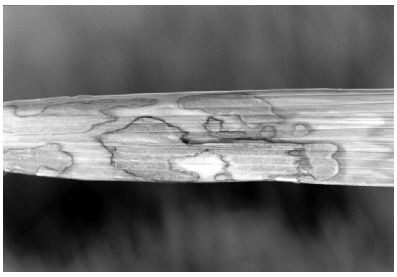
Blast: Blast is caused by the fungus, *Pyricularia grisea.* The leaf blast phase occurs between the seedling and late tillering stages. Leaf spots start as small white, gray or blue-tinged and then enlarge quickly under moist conditions to either oval, diamond-shaped spots or linear lesions with pointed ends with gray or white centers and narrow brown borders.

Leaves and whole plants are often killed under severe conditions. Rotten neck symptoms appear at the base of the panicle, starting at the node soon after heading. The tissue turns brown to chocolate-brown and shrivels, causing the stem to snap and lodge. Panicle branches and stems of florets also have gray-brown lesions.

Scouting for blast should begin early in the season during the vegetative phase and continue through to heading. Leaf blast will usually appear in high areas of the field where the flood has been lost or is shallow. As part of management, the flood must be maintained. Areas of heavy nitrogen fertilization and edges of the fields are also potential sites. If leaf blast is in the field or has been reported in the same general area, and if the variety is susceptible, fungicidal applications are advisable to reduce rotten neck blast. The absence of leaf blast does not mean rotten neck blast will not occur. Fungicide timing is critical (Table 8). If a single fungicide application is used to control blast, it should be applied when 50-70 percent of the heads have begun to emerge. Application before or after this growth stage will not provide good control of this disease! This growth stage is very difficult to detect, so it is important to scout for the crop growth stage

at the same time as scouting for disease. Allow time to obtain a fungicide, schedule the application, and allow for poor weather conditions. Under heavy blast pressure, two applications, one at boot and one at 50-70 percent heading, may be needed to effectively suppress blast.

Sheath Blight: Sheath blight is one of the most important diseases in rice in Louisiana. It is characterized by large, oval spots on the leaf sheaths and irregular spots on leaf blades. Infections usually begin during the late tillering/joint-elongation stages of growth. The fungus, *Thanatephorus cucumeris (Rhizoctonia solani),* survives between crops as structures called sclerotia or as hyphae in plant debris. Sclerotia, or plant debris, floating on the surface of irrigation water serve as sources of inoculum that attack and infect lower sheaths of rice plants at the waterline. Fungal mycelium grows up the leaf sheath, forms infection structures, infects and causes new lesions. The infection can spread to leaf blades. After the panicle emerges from the boot, the disease progresses rapidly to the flag leaf on susceptible varieties. With very susceptible varieties, the fungus will spread into the culm from early sheath infections. Infected culms are weakened and the tillers may lodge or collapse.



Sheath blight

As lesions coalesce on the sheath, the blades turn yellow-orange and eventually die. Damage is usually most common where wind-blown, floating debris accumulates in the corners of cuts when seedbeds are prepared in the water. Disease severity can be reduced by integrating several management practices. Dense stands and excessive use of fertilizer both tend to increase the damage caused by this disease. Rotation with soybeans or continuous rice increases the amount of inoculum in field soils. Fungicides are available for reducing sheath blight.

Avoid late application beyond 50-70 percent heading (Table 8). However, in some areas of south Louisiana, the fungus has developed resistance to the strobilurin fungicides and other modes of action must be used to control sheath blight.

Bacterial Panicle Blight: Bacterial panicle blight, caused by the bacteria *Burkholderia glumae* and *gladioli*, is one of the most important rice diseases in the South. The disease is associated with hot weather.

Losses include reduced yields and poor milling. The bacteria are seedborne and survive in the soil. The bacteria appear to survive as an epiphytic population on the leaves and leaf sheaths and follow the canopy up.

Bacterial panicle blight

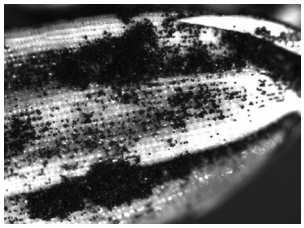
This population infects the grain at flowering and causes grain abortion and rotting during grain filling. The disease is first detected as a light- to medium-brown discoloration of the lower third to half of hulls shortly after emergence.

The stem below the infected grain remains green. Pollination occurs, but the grain aborts sometime after grain filling begins. The disease tends to develop in circular patterns with the most severely affected panicles in the center remaining upright because of grains not filling. No chemical control measures are recommended. Some varieties have more resistance than others. Rice planted later in the season and fertilized with high nitrogen rates tends to have more disease.

Cercospora: The fungus *Cercospora janseana* causes narrow brown leaf spot and other symptoms. Leaf lesions are linear and reddish-brown. On susceptible cultivars, the lesions are wider, more numerous and lighter brown with gray necrotic centers. Spots usually appear near heading. Both young and old leaves are susceptible. Sheaths and glumes can be infected causing significant discoloration and necrosis. On sheaths, the disease is referred to as "sheath net blotch" because of the brown cell walls and the tan-to-yellow intracellular areas that form a netlike pattern. Branches of the seed heads can become infected, causing premature ripening and unfilled grains. Symptoms can be confused with rotten neck and panicle blast lesions. Narrow, brown disease lesion symptoms usually are darker brown and develop in the internodal area of the neck. Grain infection appears as a diffused brown discoloration. The disease is often severe on the second crop. Resistance to narrow brown leaf spot is available, but new races of the pathogen develop rapidly. Low and high nitrogen rates appear to favor disease development. Fungicides containing propiconazole are most effective. The best timing against all stages of this disease is between panicle differentiation and boot growth stages (Table 8). The later the rice is planted, the earlier the fungicide must be applied.

Cercospora

Kernel Smut: Kernel smut symptoms appear just before maturity. A black mass of smut spores replaces all or some of the endosperm of the seed. Often, the spores ooze out of the grain leaving a black mass along the seam of the hulls. The fungus, *Tilletia barclayana*, overwinters as spores in soil of affected fields and in seed. Significant quality and yield reductions are possible. Disease development is favored by high nitrogen rates. Research results from other states indicate that boot applications of propiconazole containing fungicides reduce damage significantly.



Kernel smut

False Smut: The false smut fungus, *Ustilaginoidea virens*, infects rice at flowering. The disease is characterized by large orange to olive-green spore balls that replace one or more grains on a head. In the middle of the spore masses are sclerotia that act as the survival structure. These sclerotia can be spread with the seed and infect the next crop. Removal of the sclerotia in seed cleaning reduces spread. Seed treatment with a fungicide also reduces inoculum potential. False smut spores cause discoloration of milled rice, but no significant yield loss is associated with the disease. Presence of the smut sclerotia in grain for export has caused problems. Some foliar fungicides applied at boot can reduce disease incidence.

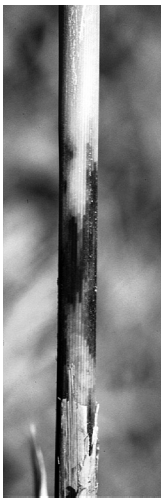
False smut

Sheath Rot: Sheath rot is caused by the fungus *Sarocladium oryzae*. Symptoms are most severe on the uppermost leaf sheaths that enclose the young panicle during the boot stage. Lesions are oblong or irregularly oval spots with gray or light brown centers and a dark reddish-brown diffuse margin. Early or severe infections may affect the panicle so that it only partially emerges. The unemerged portion of the panicle rots with florets turning red-brown to dark brown. A powdery white growth consisting of spores and hyphae of the pathogen is usually observed on the inside of affected leaves. Insect or mite damage to the boot or leaf sheaths increases the damage from this disease. Emerged panicles may be damaged with florets discolored reddish-brown to dark brown and grain not filling. Some varietal resistance is available. The disease is usually minor, affecting scattered tillers in a field and plants along the levee. Occasionally, large areas of a field may have significant damage. No control measures are currently recommended.

Sheath rot

Stem Rot: The fungus *Sclerotium oryzae* causes stem rot. Losses are not usually detected until late in the season when control practices are ineffective. Damage appears as severe lodging, which makes harvesting difficult. Seed sterility also has been reported. No high level of resistance to stem rot is available. High nitrogen and low potassium levels favor the disease. Stem rot is more serious in fields that have been in continuous rice for several years. The pathogen overwinters as sclerotia in the top 2-4 inches of soil and in plant debris. During early floods, sclerotia float to the surface, come in contact with the plant, germinate and infect the tissues near the water surface.

The first symptom is a black angular lesion on leaf sheaths near the waterline at tillering or later growth stages. As lesions develop, the outer sheath may die, and the fungus penetrates into the inner sheaths and then finally the culm. These become discolored and have black or dark brown lesions.



Stem rot

At maturity, the softened culm breaks, plants lodge and numerous small, round, black sclerotia develop in the dead tissues. The fungus can continue to develop in the stubble after harvest, and numerous sclerotia are produced.

Control measures include burning or cultivating stubble after harvest to destroy sclerotia, using crop rotation when possible, applying potassium fertilizer and avoiding excessive nitrogen rates. Fungicidal sprays used in a general disease control program against other fungal diseases may reduce damage due to stem rot.

Grain and Head Disorders: Many fungi and bacteria infect developing grain and cause spots and discoloration on the hulls or kernels. Damage by the rice stink bug, *Oebalus pugnax F.*, also causes discoloration of the kernel. Kernels discolored by fungal infections or insect damage are commonly called pecky rice. This is a complex disorder in rice that involves many fungi, the white-tip nematode and insect damage. High winds at the early heading stage may cause similar symptoms. Proper insect control and disease management will reduce this problem.

Straighthead: This physiological disorder is associated with sandy soils, fields with arsenic residues or fields having anaerobic decomposition of large amounts of organic matter incorporated into the soil before flooding. Panicles are upright at maturity because the grain does not fill, or panicles do not emerge from the flag leaf sheath. Hulls may be distorted and discolored, with portions missing or reduced in size. Distorted florets with a hook on the end are called "parrot beak" and are typical of straighthead. Plants are darker green or blue-green and often produce new shoots and adventitious roots from the lower nodes. These symptoms can be mimicked by herbicide damage. Management is by using resistant varieties and draining the field approximately 10 days before internode elongation (green ring) as well as allowing the soil to dry until it cracks. This growth stage can be determined by slicing the crown of the plant lengthwise and counting the nodes. When three nodes are distinctly visible, internode elongation is approximately 10 days away. The DD-50 Rice Management Program may also be consulted to determine the correct drain time. It is important that the flood be established again by internode elongation.

Table 7. Reaction of Rice Varieties to Major Diseases and Disorders.

VS indicates a very susceptible reaction, S indicates a susceptible reaction, MS indicates a moderately susceptible reaction, MR indicates a moderately resistant reaction, R indicates a resistant reaction and --- indicates that the reaction is not known. Varieties labeled S or VS for a given disease may be severely damaged under conditions favoring disease development.

Variety	Blast	Sheath Blight	Cercospora	Bacterial Panicle Blight	Straighthead
Caffey	R	MS	R	MS	S
Catahoula	MR	S	R	MS	S
Cheniere	MS	S	S	MS	MR
CL111	MS	VS	S	VS	S
CL151	VS	S	S	VS	VS
CL152	S	S	MR	MR	MR
CL153	MS	S	MS	MS	MS
CL163	VS	S	R	MS	MS
CL172	MS	S	S	MS	MS
CL271	MR	MS	MR	MS	MR
CL272	MS	S	S	MS	MS
CLXL729	R	MS	R	R	MS
CLXL745	R	MR	R	MR	MR
Cocodrie	MS	VS	S	S	S
Cypress	MS	VS	S	S	MR
Della-2	R	S	MS	MS	MR
Diamond	S	S	---	MS	MS
Jazzman	R	MS	S	S	MS
Jazzman-2	MS	S	S	VS	VS
Jupiter	S	MS	R	MR	MR
LaKast	S	MS	MS	MS	MS
Mermentau	S	S	MS	MS	S
Roy J	S	MR	R	MS	S
Titan	MS	S	---	MS	MS
XP753	R	MR	R	MR	MR
XP760	R	MR	R	MR	MR

Rice Disease Management

Yield potential of any rice variety can be severely reduced under high disease levels. An integrated disease management program including the following practices should be implemented:

- Plant resistant varieties.
- Avoid late planting.
- Maintain proper fertility levels.
- Maintain adequate flood (avoid loss of flood).
- Use fungicides at the correct growth stage if necessary.

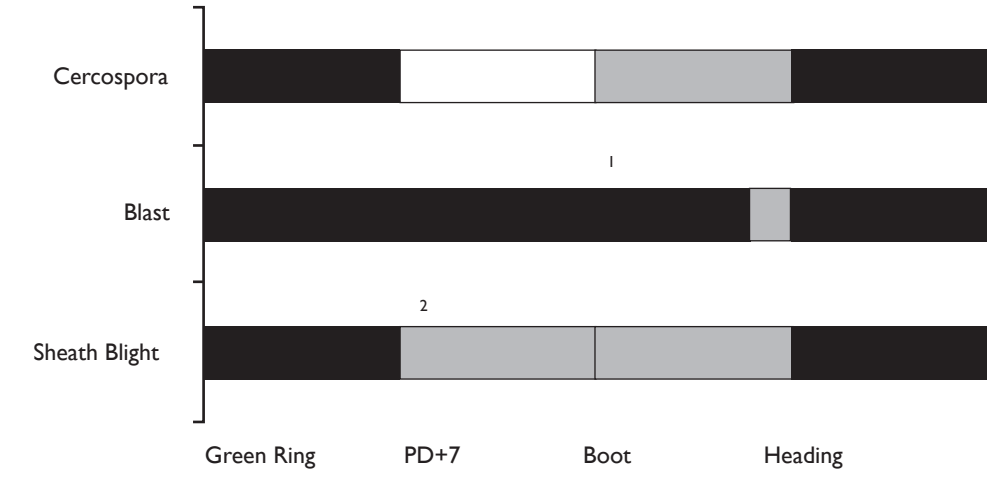
Fungicide timing is critical for disease control (Table 8). Sheath blight should be treated between early boot and heading but not beyond 50-70 percent heading. Blast must be treated at the 50-70 percent heading growth stage. Yield and grain quality increases as a result of disease control and quickly decreases if fungicide is applied after 70 percent heading. Remember, this growth stage is very difficult to detect, so it is important to scout for the rice growth stage at the same time as you scout for disease. Also, you will need to allow time to obtain a fungicide, schedule the application and allow for poor weather conditions to apply the fungicide at the correct time. The use of foliar fungicides is justified in many cases. Some factors to consider in making this decision are whether or not:

a. The field has a history of disease.
b. The variety is susceptible.
c. The yield potential is good.
d. The rice is being grown for seed.
e. The rice was planted late (late-planted rice is more likely to encounter foliar disease problems than early-planted rice).
f. A second crop is planned. (Disease not suppressed in the first crop may cause significant damage in the second crop).

Scouting for diseases should begin early in the season. For sheath blight, very susceptible to susceptible cultivars will experience an economic loss if 5 to10 percent of the tillers are infected during vegetative stages. For moderately susceptible cultivars, the level is 15 percent. At these levels, consider using a fungicide. For blast control, apply a foliar fungicide at early heading (50-70 percent heads emerging) when leaf blast symptoms are present. Leaf blast does not always precede rotten neck blast, and preventive applications of a fungicide may be warranted if a blast-susceptible variety is grown. The incidence and severity of blast increases when plants are stressed (loss of flood, fertility imbalance, etc.). Draining for straighthead and/or water weevil control may increase the incidence and severity of blast. Also, blast is normally worse on later planted rice. *Cercospora* disease control and yield increases appear best when fungicides are applied between panicle differentiation and boot growth stages. Propiconazole containing fungicides have the best activity against *Cercospora*. They may not be applied to the second or ratoon crop. For reaction of rice varieties to major diseases, see Table 7.

Additional information on rice disease control can be obtained at www.LSUAgCenter.com/ricediseases.

Table 8. Rice Fungicide Timing for Best Disease Management.



[1]A boot application followed by the heading spray may be necessary if diseases pressure is high and the variety is susceptible.
[2]An early application may be necessary if sheath blight appears early and is severe followed by the boot to heading application.

Weed Management in Rice

Management of weeds is critical for optimum rice production in both dry- and water-seeded systems. Although herbicide options and management strategies differ under these systems, managing both herbicides and water in a timely manner is critical.

In dry-seeded production, four to six weeks may elapse between planting and permanent flood establishment, and controlling weeds during this period is critical for maximizing yields. During this time, weeds, such as barnyardgrass, broadleaf signalgrass, morningglory and hemp sesbania, can become established. Although these weeds can survive a permanent flood, establishment and maintenance of a sufficient flood over these weeds can enhance control.

The effectiveness of selected rice herbicides on common rice weeds is presented in Table 9. The effectiveness of selected burndown herbicides on common winter vegetation is presented in Table 10. The activity of selective herbicide programs for perennial grass control is presented in Table 11. Information about rice herbicide use in crawfish production can be found in Table 12.

Herbicide Options for Weed Control

2,4-D – (Burn-down; Postemergence). Herbicide controls most broadleaf weeds in rice. Apply herbicide after tillering but before panicle initiation. A shallow flood should be present at the time of application. Refer to specific 2,4-D product labels for use on ratoon crop rice.

Aim – (Postemergence). Contact broadleaf herbicide that controls morningglory, hemp sesbania, jointvetch and Texasweed. Aim is more effective when tank-mixed with Grandstand or propanil. Aim has no soil activity.

Command – (Preemergence, Postemergence and Pegging). Command provides economical residual control of annual barnyardgrass, broadleaf signalgrass, sprangletop and fall panicum when applied before weed emergence. Command may be applied as a surface broadcast application before rice emergence or as an early post-emergence treatment to rice at the 1- to 2-leaf growth stage. Early postemergence applications with Command usually include a herbicide, such as propanil, to control emerged grass and broadleaf weeds. Command rates are soil texture dependent. Apply by ground equipment to minimize drift. Refer to label for aerial application restrictions in Louisiana. In water-seed rice, Command may be applied by air when impregnated on a granular fertilizer; rice should be in the 1- to 2-leaf stage. Use a minimum of 150 pounds of dry fertilizer per acre. Field must be drained prior to application. Applications are restricted to selected parishes. Consult label for specific parishes in Louisiana. Delay reflooding for at least 48 hours.

Basagran – (Postemergence). Controls annual and yellow nutsedge, redstem, ducksalad and dayflower. Basagran is a contact herbicide that must be applied to small, actively growing weeds. Lowering the flood may be required to expose weeds. Basagran may be applied to ratoon rice.

Beyond – (Postemergence). Apply only to Clearfield rice varieties and Clearfield hybrids in a dry-, drill- or water-seeded production. Beyond selectively controls red rice, annual grasses and broadleaf weeds. The application must be made after an application of Newpath or Clearpath. Beyond can be applied from 4-leaf to panicle initiation (green ring) plus 14 days for Clearfield varieties and 4-leaf to panicle initiation (green ring) for Clearfield hybrids. Beyond can be applied from 4 to 6 ounces per application with no more than two applications per season and should not exceed a total of 10 ounces per acre.

Bolero – (Preemergence and Postemergence). Controls barnyardgrass, sprangletop and annual sedges and suppresses some aquatic weeds. The herbicide should be applied preemergence to dry-seeded rice after soil has been sealed by irrigation or rainfall. Apply postemergence to dry-seeded rice to wet soil after rice has emerged or to dry soil when rice is in the 2- to 3-leaf stage. For water-seeded rice, apply after rice is in the 2-leaf stage. Treatment usually is tank-mixed with a postemergence herbicide and surface irrigated or flooded within three days. Do not submerge rice when applying permanent flood. Residual control usually will not exceed three weeks.

Broadhead – (Postemergence). A prepackaged mixture of quinclorac plus carfentrazone (Aim) for control of broadleaf weeds and grasses. Quinclorac provides both residual and postemergence activity and carfentrazone provides only postemergence activity. The product is labeled as preplant, preemergence and postemergence to rice, but it has a better fit as a postemergence herbicide. Rice should have at least two leaves before Broadhead is applied postemergence.

Clearpath – (Preemergence and Postemergence). Apply only to Clearfield rice varieties and Clearfield hybrids in dry- or water-seeded production. Clearpath is a package mixture of Newpath and Facet. Clearpath controls red rice, annual sedges, barnyardgrass, broadleaf signalgrass, hemp sesbania, jointvetch and morningglory. This herbicide can be applied seven days prior to rice planting preemergence and postemergence up to 5-leaf rice in dry-seeded rice and 2- to 5-leaf rice in water-seeded rice. Apply at a rate of half a pound per acre, which is the equivalent of 4 ounces per acre of Newpath and 0.4 of a pound per acre of Facet.

Clincher – (Postemergence). This contact grass herbicide controls barnyardgrass, broadleaf signalgrass, fall panicum, knotgrass and sprangletop. Clincher has no activity on broadleaf weeds. Apply to small actively growing grasses in the 2- to 4-leaf stages. Clincher has activity as a post-flood treatment on 4-leaf to 2-tiller grasses. Clincher works best under saturated soil conditions. Refer to label for approved tank mixes.

Facet – (Preemergence and Postemergence). Provides preemergence and postemergence control of

barnyardgrass, hemp sesbania, broadleaf signalgrass and morningglory. The herbicide does not control sprangletop or nutsedge. Preemergence applications are restricted to drill-seeded rice only. Rainfall or surface irrigation is necessary for herbicide activation. Postemergence applications should be applied after rice is in the 2-leaf stage. A half of a pound per acre rate of Facet DF is equivalent to 32 ounces per acre of the Facet L. Follow the label concerning the addition of crop oil or surfactants. Tomatoes and cotton are sensitive to Facet drift.

Facet + Pendimethalin – (Delayed Preemergence and Postemergence). The combination controls annual grasses including sprangletop and several broadleaf weeds in drill-seeded rice. Rice seed must have imbibed germination water prior to herbicide application or five to nine days after planting. Do not apply to water-seeded rice as a delayed preemergence application.

Grandstand – (Postemergence). Controls alligatorweed, hemp sesbania, Texasweed, jointvetch and other broadleaf weeds. It does not control ducksalad. Do not overlap swaths or dress ends during application. Grandstand may be applied to ratoon rice. Grandstand works better in a herbicide mixture with propanil or another postemergence herbicide.

Grasp – (Preemergence and Postemergence). Controls barnyardgrass, annual sedges and broadleaf weeds. The residual activity is limited to approximately 10 days. Temporary crop injury, in the form of stunting and root mass reduction, may occur. This injury is transient; however, the plant normally recovers within two to three weeks. Refer to label for approved surfactants and tank mixes.

Grasp Xtra – (Postemergence). This is a prepackaged mixture of penoxulam plus triclopyr. The two products together improve control of difficult-to-control weeds compared to when applied alone. In drill-seeded production, apply to rice in the 2- to 3-leaf to half-inch internode growth stages. In water-seeded production, apply to rice in the 3- to 4-leaf to half-inch internode growth stages. Do not apply more than 22 ounces per acre per year.

League – (Preemergence and Postemergence). Controls grasses, sedges, hemp sesbania, jointvetch and Texasweed. League can be applied from 3 to 6 ounces per acre. League should be applied at 5-6 ounces per acre when applied preemergence. Postemergence applications should be applied at 3-4 ounces per acre. The 4 ounces per acre rate can provide some residual activity. Significant injury can occur on long-, medium- and short-grain rice when applied preemergence. Refer to the label for tank mixes and recommended adjuvants.

Londax – (Postemergence). Controls hemp sesbania, ducksalad, pickerelweed and other aquatic broadleaf weeds and sedges. The herbicide is most effective when applied to submerged weeds one to seven days after the permanent flood is established. When applied before permanent flood, tank-mix with propanil to broaden weed control spectrum. Londax may be used for aquatic broadleaf weed control in areas where 2,4-D is prohibited.

Newpath – (Preemergence and Postemergence). Apply only to Clearfield rice varieties and Clearfield hybrids. Newpath controls red rice, sedges and annual grasses. The first application to Clearfield rice should be Newpath or Clearpath for red rice control. The herbicide is weak on hemp sesbania and jointvetch. A total postemergence program is more effective. Adequate soil moisture is required for optimum herbicide residual activity. Newpath must be applied prior to flooding when rice is in the 3- to 5-leaf growth stages. Permanent flood should be established as soon as possible after second application.

Obey – (Preemergence and Postemergence). Obey is a prepackage mixture of Command plus quinclorac. The mixture provides both broadleaf and grass control. Obey controls barnyardgrass, broadleaf signalgrass, sprangletop, jointvetch and hemp sesbania. Apply postemergence to 2- to 5-leaf rice. Follow the label concerning the addition of crop oil concentrate. Refer to rates for specific soil types. Obey can be applied from 26-52 ounces per acre.

Permit/Halomax – (Preemergence and Postemergence). Controls annual and perennial sedges, hemp sesbania and jointvetch. Permit/Halomax may be mixed with other postemergence herbicides to broaden weed control spectrum. Applications may be made pre- or post-flood. Can also be used as a salvage treatment 48 days prior to harvest.

Indian toothcup

Permit Plus – (Preemergence and Postemergence). A prepackaged mix of halosulfuron and thifensulfuron. The addition of thifensulfuron to Permit broadens the weed spectrum. The herbicide has excellent activity on all weeds controlled by Permit with increased activity on alligatorweed and ducksalad. The herbicide should be applied at 0.75 of an ounce per acre, and the rate should not be reduced as is often done with Permit. The 0.75 of an ounces per acre rate provides half an ounce per acre of Permit and 0.06 of an ounce per acre of thifensulfuron. A reduction in rate will reduce the benefit of the thifensulfuron in the mix. It also can be used as a salvage treatment 48 days prior to harvest, but crop maturity may be delayed and result in a yield reduction.

Propanil – (Postemergence). Sold under several trade names. Controls annual grasses, annual sedges and broadleaf weeds in the seedling stage. Best control is achieved when applied 10 to 14 days after seeding. Propanil is often tank-mixed with a residual herbicide, such as Command, Prowl or Bolero.

RebelEX – (Postemergence). A prepackaged mixture of Clincher plus Grasp. This product should be applied to small actively growing weeds. Grasses should not exceed the 3-leaf stage to avoid antagonism. The field should be wet for maximum Clincher activity, but weed vegetation should be 75 percent exposed for Grasp activity.

Regiment – (Postemergence). A contact herbicide with activity on barnyardgrass and broadleaf weeds. The herbicide has little to no soil activity. Do not apply to rice prior to the 3-leaf stage. Temporary crop injury, in the form of stunting, may occur. Refer to label for approved Indian toothcup adjuvants and herbicide mixes.

RiceBeaux – (Postemergence). A prepackaged mixture of Bolero (thiobencarb) plus propanil for control of broadleaf and grass weeds. Provides control of barnyardgrass, sprangletop and broadleaf aquatic weeds.

Ricestar HT – (Postemergence). Controls barnyardgrass, broadleaf signalgrass and sprangletop. Ricestar has no activity on broadleaf weeds. Apply to small actively growing grasses in the 2- to 3-leaf stages. Ricestar HT works best under saturated soil conditions. The best option for Nealley's sprangle top control is 24 ounces per acre. Refer to label for approved tank mixes.

Sharpen – (Preemergence and Postemergence). When used as a preemergence apply 2 ounces per acre. Do not apply more than 1 ounce per acre when applying postemergence. Controls many broadleaf weeds and grasses less than 2- to 3-leaf. Suppression is observed on aquatic weeds. Excessive injury can occur under saturated conditions. Refer to label for appropriate surfactants.

Strada – (Postemergence). Controls annual sedges, hemp sesbania and jointvetch. Strada may be mixed with other postemergence herbicides to broaden the spectrum. A Strada plus propanil mixture is often recommended.

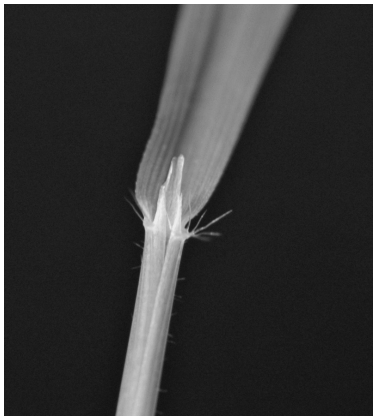
Strada PRO – (Postemergence). A prepackaged mixture of Strada plus halosulfuron that broadens the weed control spectrum compared with Strada alone, especially on sedge species. It is formulated as a 54 percent wettable granule. Apply 2.08-2.5 ounces per acre prior to rice emergence through permanent flood. Do not apply after the half-inch internode stage.

Strada XT – (Postemergence). A prepackaged mixture of Strada plus quinclorac. The mixture provides both broadleaf and grass control. It is formulated as a 70 percent wettable granule. Apply 6-10 ounces per acre prior to or after rain or flushing. Rice seed exposed to spray may be severely injured.

Harvest Aids

Aim – May be applied to rice to desiccate troublesome broadleaf weeds that may be present at harvest at 1.6-3.2 ounces per acre. Aim may be used alone or as a tank mixture with other harvest aids. Applications shall be made when the crop is mature and the grain has begun to dry down. May be applied three days prior to harvest; more time is usually needed for satisfactory results. Activity is directly related to temperature and sunlight. Refer to the Aim label for appropriate timings, adjuvants and application volume (GPA).

Sodium Chlorate – Several formulations of sodium chlorate are labeled for use in rice. Refer to each label for appropriate rates, timings, adjuvants and application volume (GPA). Sodium chlorate works best with high water volume (GPA) to aid in coverage. Activity is directly related to temperature and low humidity. Use sodium chlorate to facilitate harvest and reduce moisture in fully mature seed heads and to desiccate some weeds in mature rice. Apply 7-10 days before anticipated harvest. Thorough coverage of the crop is essential to achieve good results.



Red rice

Table 9. Effectiveness of Selected Rice Herbicides.

	Palmleaf morningglory	Eclipta	Barnyardgrass	Red rice	Sprangletop	Signalgrass	Fall panicum	Sedge	Alligatorweed	Ducksalad	Redstem	Hemp sesbania	Waterhyssop	Jointvetch	Smartweed	Dayflower	Texasweed
Preplant Incorporated Or Preemergence	---------- **Weed Control Ratings** ----------																
Bolero PPS	4	0	8	8	8	7	6	5	4	7	3	0	6	4	5	7	5
Bolero PRE/DPRE	5	8	8	0	8	5	7	5	4	8	8	6	8	5	5	8	6
Clearpath	8	8	9	8	8	9	5	9	6	8	8	7	6	7	6	7	8
Command	0	0	9	0	8	8	9	0	0	7	0	0	0	0	2	7	0
Facet L	8	8	9	0	0	9	5	2	4	3	4	7	6	7	0	5	4
Newpath (PPI/PRE)	8	6	8	8	8	9	5	9	6	8	8	4	6	4	6	7	8
Obey (PRE)	8	8	9	0	8	9	8	2	4	7	4	7	6	7	2	7	4
Pendimethalin + Facet (DPRE)	8	8	9	0	9	8	5	4	6	3	2	8	4	7	0	3	6
Sharpen	8	7	4	4	4	4	6[6]	6	4	4	6	7	6	7	6	7	7
Postemergence																	
2,4-D	9	9	0	0	0	0	0	2[3]	8	9	9	9	9	7	6	8	9
Aim[4]	8	6	0	0	0	0	0	5	5	4	6	9	7	6	8	5	6
Aim + Grandstand	9	8	0	0	0	0	0	5	8	6	9	9	8	9	8	6	7
Basagran	8	8	0	0	0	0	0	8[4]	4	8	9	4	8	3	7[2]	9	2
Beyond	8	6	8	9	7	9	7	8	3	2	8	3	6	3	5	6	7
Blazer	5	4	0	0	0	0	0	0	4	3	9	9	0	0	0	0	5
Bolero + Propanil (RiceBeaux)	5	9	9	0	9	9	8[2]	7	5	7[2]	7[2]	9	9	8[2]	6[2]	8[2]	8
Broadhead	8	9	9	0	0	9	5[2]	5	6	4	6	9	7	7	8	5	6
Clearpath	8	9	9	8	6	9	6	8	6	3	3	8	6	8	6	6	7
Clincher	0	0	9	0	9	9	8	0	0	0	0	0	0	0	0	0	0
Facet L	8	9	9	0	0	9	5[2]	4	6	3	3	8	3	8	0	3	6
Facet L + Propanil	8	9	9	0	7[2]	9	8[2]	5[3]	6	7[2]	7[2]	9	8	9[2]	6[2]	7[2]	8
Grandstand	9	8	0	0	0	0	0	5	7	3	9	7	8	8	7	6	9
Grasp	3	7	9	0	3	3	3	8	7	8	8	9	7	7	8	7	6
Grasp Xtra	9	8	9	0	3	3	3	8	7	8	9	9	8	8	8	7	9
League	8	8	0	0	0	0	0	8	6	7	8	9	-	8	-	8	8
Londax	5	8	0	0	0	0	0	8	7	9	9	6	9	6	6	8	8
Newpath	8	6	8	8	6	9	4	8	3	2	8	3	6	3	4	6	7[4]
Obey	8	9	9	0	7[2]	9	7[2]	4	6	3	3	8	3	8	0	3	6
Permit/Halomax	7[4]	8	0	0	0	0	0	9	4	5	8	9	4	9	4	8	7[4]
Permit/Halomax + Londax	7[4]	8	0	0	0	0	0	9	7	9	9	9	9	9	6	8	8
Permit Plus	7[4]	9	0	0	0	0	0	9	6	7	9	9	6	9	8	8	7[4]
Propanil	5	8	9	0	7[2]	9	8[2]	4[3]	5	6[2]	7[2]	7	8	8[2]	6[2]	6[2]	6
Propanil + Aim	9	8	9	0	7	9	8[2]	6	5	6	7	9	8	9	8[2]	6	6
Propanil + Londax	9	9	9	0	7[2]	9	8[2]	9	7	7	9	9	8	9[2]	8	8[2]	9
Propanil + Permit/Halomax	9	9	9	0	7[2]	9	8[2]	9	5	5	8	9	9	9	5	8	8[4]
Pendimethalin + Facet	8	8	9	0	8	9	5[2]	4	6	3	2	8	4	7	0	3	6
Pendimethalin + Propanil	5	9	9	0	9	9	8[2]	5	5	7	9	9	8[2]	8[2]	6[2]	7	6
RebelEX	3	7	9[2]	0	9[2]	9[2]	8[2]	8	7	8	8	9	7	7	8	7	6
Regiment	8	6	9	0	3	3	0	7[3]	7	8[2]	8	8	7	8	7	7	8
Ricestar HT	0	0	9	0	8	9	7[2]	0	0	0	0	0	0	0	0	0	0
Sharpen	8	8	0	6	6[2]	5[2]	6[2]	6[3]	7	8	9	8	-	9	7	7	8[5]
Strada	7	8	0	0	0	0	0	8	5	7	9	9	8	9	6	9	6
Strada PRO	7	8	0	0	0	0	0	9	5	7	9	9	8	9	6	9	6
Strada XL	8	9	9	0	0	9	5[2]	8	6	7	8	9	8	9	6	9	4

[1]With proper water management.
[2]Controlled only when small (less than 2-leaf).
[3]Annual sedge suppression.
[4]Weeds must be less than 4 inches tall.

Table 10. Effectiveness of Selected Burndown Herbicides.

Preplant Burndown	Rice Plant Back (Days)	Annual ryegrass	Annual bluegrass	Carolina foxtail	Little barley	Henbit	Cutleaf evening primrose	Chickweed	Geranium spp.	Curly dock	Buttercup spp.	Mare's tail	Smartweed	Swinecress	Shephard's purse	Bittercress
		Weed Control Ratings														
2,4-D	30; 1 inch rain	0	0	0	0	5	9	3	6	7	9	6	6	6	9	7
FirstShot + glyphosate	0	7	9	9	9	9	7	9	8	9	9	9	9	9	9	9
Gramoxone XL	0	4	9	8	9	8	4	9	9	4	9	5	4	2	9	9
Grandstand + glyphosate	21 dry-seed/14 water-seed	7	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Glyphosate	0	7	9	9	9	6	5	9	5	6	9	9	7	7	9	9
Leadoff	pH<6.5; 60 days pH>6.5; 90 days	8	9	-	-	9	9	9	-	-	9	9	9	-	-	-
Sharpen + glyphosate	15	7	9	9	9	9	8	9	7	9	9	9	9	9	9	9
Valor + glyphosate	30 days	7	9	9	9	9	8	9	6	8	9	9	9	8	9	9

Table 11. Activity of Selective Herbicide Programs for Perennial Grass Control.

	Brook paspalum	Knotgrass	Creeping Rivergrass[3]	Water paspalum	Nealley's Sprangletop
Command PRE[2]	4	5	4	5	5
Command PRE fb Clincher[1]	5	9	8	8	6
Command + Facet PRE[2]	4	5	4	5	6
Command + Facet PRE[2] fb Clincher[1]	5	9	8	9	6
Command PRE fb Grasp[1]	5	5	7	5	6
Facet + pendimethalin DPRE[2]	4	6	5	7	6
Facet + pendimethalin DPRE fb Clincher[1]	6	9	7	9	6
Grasp[1]	4	2	6	2	6
Clincher fb Clincher[1]	7	9	8	9	6
Newpath fb Beyond[1]	7	9	8	8	6
Newpath fb Newpath[1]	7	9	8	8	6
Regiment fb Regiment[1]	3	2	7	2	4
Ricestar HT fb Ricestar HT[1]	3	4	6	5	8
Propanil[1]	2	3	3	2	5

[1]Control rating is based on herbicides applied to small actively growing plant segments.
[2]Weed control rating taken two weeks after application.
[3]Also referred to as perennial barnyardgrass.

Table 12. Crawfish Production and Rice Herbicides.

Aim	Commercial crawfish not specifically mentioned; however, herbicide is moderately toxic to fish.
Basagran	Do not use Basagran on rice fields where the commercial cultivation of crawfish is practiced.
Beyond	Crawfish production not specifically mentioned.
Blazer	Do not harvest crawfish from treated rice areas for food.
Bolero	Crawfish production not specifically mentioned. Toxic to shrimp.
Broadhead	Do not use treated rice fields for the aquaculture of edible fish and crustaceans.
Clearpath	Do not use treated rice fields for the aquaculture of edible fish and crustaceans.
Clincher	Do not fish or commercially grow fish, shellfish or crustaceans on treated acres during the year of treatment.
Command	Do not apply on rice fields in which concurrent crawfish farming is included in the cultural practices.
Duet	Do not apply to fields where commercial crawfish farming is practiced.
Facet	Do not use treated fields for aquaculture of edible fish or crawfish.
Grandstand	Do not commercially grow shellfish or crustaceans on treated acres during the year of treatment.
Grasp	Except for crawfish, do not fish or commercially grow fish, shellfish or crustaceans on treated acres during the year of treatment.
GraspXtra	Do not apply later than three months prior to crawfish production.
League	Do not apply to rice fields if fields are used for the aquaculture of edible fish and/or crustaceans.
Londax	Do not harvest crawfish prior to harvesting rice.
Newpath	Crawfish production not specifically mentioned.
Obey	Do not apply on rice fields in which concurrent crawfish or catfish farming are included in the cultural practices.
Permit/Halomax	Crawfish production not specifically mentioned in restrictions.
Pendimethalin	Crawfish not specifically mentioned. Product may be hazardous to aquatic animals.
Permit Plus	Crawfish not specifically mentioned.
Propanil	Crawfish not specifically mentioned in restrictions. Commercial catfish production prohibited.
RebelEX	Do not fish or commercially grow fish, shellfish or crustaceans on treated acres during the year of treatment.
Regiment	Crawfish not specifically mentioned.
RiceBeaux	Applications to fields where catfish/crawfish farming is practiced and draining water from treated fields into areas where catfish farming is practiced is prohibited during 12 months following treatment. Do not use adjacent to catfish/crawfish ponds.
Ricestar HT	Ricestar must not be applied to fields where crawfish are cultured commercially.
Roundup Ultra Max	Crawfish production not mentioned in restrictions. Herbicide cannot be applied to areas where surface water is present.
Sharpen	Sharpen may be applied to rice fields used for crustacean (including crawfish) production and commercial fish production.
Storm	Do not use Storm on rice fields where commercial crawfish production is practiced.
Strada	Crawfish production not specifically mentioned.
Strada PRO	Crawfish production not specifically mentioned.
Strada XT	Crawfish production not specifically mentioned.
2,4-D	May be toxic to aquatic invertebrates.

NOTES

NOTES

Authors

This publication was prepared by the following personnel of the LSU AgCenter:

Dustin Harrell, Rice Fertility and Agronomy
Sebe Brown, Entomology
Adam Famoso, Rice Breeding
Keith Fontenot, County Agent
Donald Groth, Plant Pathology
Jeremy Hebert, County Agent
Manoch Kongchum, Rice Fertility
Steve Linscombe, Rice Breeding
Jim Oard, Rice Breeding
Michael Stout, Entomology
Eric Webster, Weed Science
Rick Zaunbrecher, Foundation Seed Program

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William B. Richardson, LSU Vice President for Agriculture
Louisiana State University Agricultural Center
Louisiana Agricultural Experiment Station
Louisiana Cooperative Extension Service
LSU College of Agriculture

Pub. 2270 (1.5M) 12/16 Rev.