

2024

RICE VARIETIES

& MANAGEMENT TIPS

2024 RICE VARIETIES & MANAGEMENT TIPS

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 are also very important in management decisions.

Additional information can be found in the Crop Enterprise Budgets publication, which can be accessed on the LSU AgCenter's rice webpage.

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 based on grain type (long or medium/short) and use (special purpose).

Clearfield (CL) varieties are resistant to Newpath and Beyond herbicides for use in the Clearfield production system. Provisia (PV) varieties are resistant to the Provisia herbicide. All rice varieties, including CL and PV herbicide-resistant varieties, are non-GMO and developed from traditional breeding approaches. After each variety name, letters in parentheses 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 three years required for recommendation.

Rice Varieties and Management Tips is available through the LSU AgCenter's rice webpage at www.lsuagcenter.com/topics/crops/rice. Additional rice production information can also be found in the Louisiana Rice Production Handbook, which is also available through the LSU AgCenter rice webpage.

Data were generated in seven research trials at the North and South Units of the H. Rouse Caffey Rice Research Station in Crowley and off-station locations in Acadia, Evangeline, St. Landry, Tensas and Vermilion parishes.

The following information is included:

Yield: Dry weight, lb/A

Milling:

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

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

Days to 50% Heading: Average number of days from emergence to 50% heading. This occurs when half of the flag leaf sheaths have panicles emerging from them. Most

varieties will reach harvest maturity (20% 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.

RICE VARIETIES

AddiJo (LA): A high amylose, intermediate gel temp variety with nonsticky cooking qualities and good yield potential. This variety is intended for specific quality markets. It has excellent grain and cooking quality desired by key Latin American export markets. It has good ratoon potential, lodging resistance and milling properties. AddiJo contains the Pita blast resistance gene and very good blast resistance. It contains the CRSP2.1 gene and is resistant to narrow brown leaf spot and moderately susceptible to *Cercospora* infection on the stem. **It is rated as susceptible to sheath blight, moderately susceptible to blast and bacterial panicle blight and moderately resistant to false smut.**

Avant (LA): A very early, high-yielding, long-grain rice semidwarf variety with very good yield potential. It has shown very good lodging resistance and excellent ratoon potential. Avant is the earliest variety available, five to 10 days earlier to 50% heading than Cheniere. It has traditional Southern long-grain cooking characteristics, with intermediate amylose and gel temp. Avant contains the CRSP2.1 gene and is resistant to narrow brown leaf spot and moderately susceptible to *Cercospora* infection on the stem. It is rated as susceptible to sheath blight, moderately susceptible to blast and bacterial panicle blight and moderately resistant to false smut.

Cheniere (LA): An early, high-yielding, high-quality, long-grain rice variety with very good yield potential, good lodging resistance and moderate resistance to straighthead. It is moderately susceptible to blast and bacterial panicle blight and susceptible to sheath blight and *Cercospora*. The variety displays excellent grain quality characteristics, has a higher amylose content and cooks less sticky than typical U.S. long grains.

CL111 (LA): A very early, short-stature, long-grain, Clearfield rice variety with very good yield potential. It averages four to seven days earlier maturity than other varieties. CL111 has good lodging resistance and blast resistance. It is susceptible to *Cercospora* and very susceptible to sheath blight and bacterial panicle blight. It has excellent seedling vigor and very good second crop potential.

CL153 (LA): An early, semidwarf, long-grain, Clearfield rice variety that displays excellent yield potential. CL153 has shown very good head rice yields and has low chalk. The variety is rated as moderately susceptible to blast,

Cercospora, bacterial panicle blight and straighthead. It is susceptible to sheath blight. CL153 has shown yield potential comparable to or slightly lower than CL151. CL153 is similar in maturity and plant height to CL151 but has improved lodging resistance. The variety has good seedling vigor and has shown good second-crop yield potential.

CLJ01 (LA): A Clearfield, aromatic, long-grain Jasmine type with low gel temp and low amylose. It has low chalk and very good milling. It is short, early maturing and offers excellent yield potential for a specialty variety. It is agronomically similar to CL153 and CL151. Moderately resistant to blast and *Cercospora*, moderately susceptible to sheath blight and susceptible to bacterial panicle blight.

CLL16 (AR): A long-grain, conventional height, Clearfield rice variety with excellent yield potential and stability and maintains strong yield potential with later planting dates. It has excellent seedling vigor. CLL16 is a few inches taller than typical Louisiana Clearfield varieties but is moderately resistant to lodging. Milling yields and ratoon potential are observed to be lower than other Clearfield varieties. CLL16 contains the Pita blast resistance gene and is resistant to blast. It also contains the CRSP2.1 gene and is resistant to narrow brown leaf spot and moderately susceptible to *Cercospora* infection on the stem. It is moderately susceptible to sheath blight and bacterial panicle blight.

CLL18 (AR): A long-grain, conventional height, Clearfield rice variety with excellent yield potential and stability and maintains strong yield potential with later planting dates. It has excellent seedling vigor. CLL18 is a few inches taller than typical Louisiana Clearfield varieties but is moderately resistant to lodging. Milling yields are observed to be lower than other Clearfield varieties. CLL18 does not contain the Pita blast resistance gene and is moderately susceptible to blast. It contains the CRSP2.1 gene and is resistant to narrow brown leaf spot and moderately susceptible to *Cercospora* infection on the stem. It is moderately susceptible to sheath blight and bacterial panicle blight.

CLL19 (LA): A long-grain, Clearfield rice variety with excellent yield potential and stability. It has very good seedling vigor. CLL19 is semidwarf, a few inches shorter than CLL16 and CLL18, and is moderately resistant to lodging. It is very early and has a heading date similar to CL111 and is four to eight days earlier than CLL18 and CLL16, respectively. CLL19 has demonstrated very good milling potential and ratoon capacity. It contains the Pita blast resistance gene and has good blast resistance. It also contains the CRSP2.1 gene and is resistant to narrow brown leaf spot and moderately susceptible to *Cercospora* infection on the stem. It is moderately susceptible to sheath blight and bacterial panicle blight.

CLM04 (AR): A Clearfield, short-stature, medium-grain rice variety with very good yield potential, having yielded comparably to Jupiter and CL272. The variety is 2 to 3 inches taller than Jupiter and has shown very good milling and grain quality. CLM04 is similar to Jupiter in days to 50%

heading and is one week later than Titan.

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, resistant to blast and moderately susceptible to bacterial panicle blight and *Cercospora*. The variety has shown good ratoon potential in limited testing.

DG263L (Nutrien Dyna-Gro): A long-grain, high amylose, inbred variety with exceptional yield potential and stability. It is recommended to be planted at a lower seeding rate than typical inbred varieties. DG263L has a maturity between CL111 and CL153, is similar in height to CL153 and is moderately resistant to lodging. The ratoon potential is lower than other varieties. The grain length is similar to PVL02 and CL151.

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 resistant to blast.

Jupiter (LA): A high-yielding, semidwarf, medium-grain variety. Jupiter is susceptible to blast, moderately susceptible to sheath blight, moderately resistant to bacterial panicle blight and straighthead and resistant to *Cercospora*. It has shown good seedling vigor and milling quality.

Mermentau (LA): An early-maturing, long-grain rice variety with very 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, straighthead and blast and moderately susceptible to bacterial panicle blight and *Cercospora*. 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.

PVL03 (LA): A long-grain, Provisia variety with excellent yield potential, milling and grain appearance. The grain length is greater than 7 millimeters. PVL03 is the highest yielding of the Provisia varieties and is very competitive with Clearfield and conventional varieties. It offers a significant improvement in disease resistance compared to PVL01 and PVL02. PVL03 is resistant to blast and contains the blast resistance gene Pita. It contains the CRSP2.1 gene and is resistant to narrow brown leaf spot, but is susceptible to *Cercospora* infection on the stem, especially in later plantings. PVL03 is similar in height to PVL01 and CL153 and has a similar maturity to Mermentau and CL153.

Taurus (AR): An early, short-stature, medium-grain rice

variety that has shown excellent yield potential and stability and has out-yielded Jupiter and Titan in recent years. It is slightly shorter than Jupiter and Titan and has equal or better milling potential.

Titan (AR): A very early, short-stature, medium-grain rice variety that has shown excellent yield potential. The variety has consistently shown comparable or better yield potential than Jupiter. Titan is similar in height and a week earlier than Jupiter in maturity. Milling yields have been observed to drop off significantly when harvested at lower moisture.

Please see Tables 1 and 2 for the agronomic characteristics and yields of the recommended varieties, Tables 3-8 for the results of 2023 variety trials and Table 9 for the stability of yield at different planting dates.

RICE HYBRIDS

Rice hybrids are available from RiceTec. RiceTec will offer nonherbicide tolerant hybrids XP753, RT7301, RT7401 and RT7302 for the 2024 season in Louisiana. Please consult RiceTec for management guidelines.

The FullPage rice cropping system is the combination of the IMI herbicide tolerance trait exclusive to RiceTec hybrids and the companion IMI herbicides, Preface and Postscript, manufactured by Adama. Four FullPage RiceTec hybrids will be available for the 2024 cropping season. The hybrids will include RT7321 FP, RT7421 FP, RT7521 FP and RT7523 FP. Please consult RiceTec for FullPage hybrid management guidelines.

The Max-Ace rice cropping system is the combination of the Max-Ace trait exclusive to RiceTec and the Highcard herbicide specifically designed to be used with Max-Ace Rice Cropping Solution manufactured by Adama. The RiceTec RTv7231 MA variety and hybrid RT7331 MA will be available for the 2024 cropping season. Please consult RiceTec for Max Ace hybrid management guidelines.

SEEDING DATES

Environmental conditions vary by location and over years; therefore, the optimal seeding time is 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 Fahrenheit, rice seed germination is negligible. From 50 to 55 degrees Fahrenheit, germination increases — but not to any great extent — until temperature is above 60 degrees Fahrenheit. Seedling survival is not satisfactory until the average daily temperature is above 65 degrees Fahrenheit.

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:

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

Extremely late planting can also be detrimental to yield. Stand establishment can be equally difficult in hot weather. The yield potential of many varieties will decrease significantly with later plantings. Insecticidal seed treatments are less effective in late-planted rice and additional control tactics should be considered. Bacterial panicle blight is 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. Many diseases (especially blast) and insect problems are more severe, and grain quality is often decreased with later-seeded rice.

The first crop should be harvested before mid-August to ensure adequate time for a ratoon crop to develop prior to the onset of cold weather. Rice planted on 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.

Table I. Agronomic Characteristics and Yields of Recommended Conventional Rice Varieties (2021-2023) in Louisiana.

Variety	Seedling Vigor	Days to 50% Heading	Plant Height (in)	% Chalk	Lodging	2021 Milling % (Whole / Total)	2022 Milling % (Whole / Total)	2023 Milling % (Whole / Total)	Mean Milling % (Whole / Total)	2021 Grain Yield (lb/A)	2022 Grain Yield (lb/A)	2023 Grain Yield (lb/A)	Mean Grain Yield (lb/A)
Long Grain													
AddiJo (HA)	G	87	39	18	MR	61/70	59/68	54/69	58/69	7,350	7,931	8,335	7,872
Avant	G	78	36	19	MR	64/71	62/68	61/71	62/70	7,370	7,744	9,252	8,122
Cheniere	G	85	38	12	R	64/73	64/71	62/72	63/72	6,769	7,993	7,769	7,511
DG263L (HA)	G	82	39	20	MR	60/68	57/66	57/68	58/72	8,187	8,315	10,092	8,865
Mermentau	G	82	38	21	MR	63/70	61/67	59/70	61/69	7,453	7,848	8,549	7,950
Medium Grain													
Jupiter	G	89	36	23	MS	63/67	63/67	56/68	61/67	8,169	7,591	6,604	7,454
Titan	VG	82	37	18	MR	62/68	61/67	55/69	59/68	7,666	7,686	7,751	7,701

Abbreviations: (HA) = High Amylose, VG = very good, G = good, R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.
Height: Height maturity in inches from soil line to extended panicle.
Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.

Table 2. Agronomic Characteristics and Yields of Recommended Herbicide-Tolerant Rice Varieties (2021-2023) in Louisiana.

Variety	Grain Type	Seedling Vigor	Days to 50% Heading	Plant Height (in)	% Chalk	Lodging	2020 Milling % (Whole / Total)	2021 Milling % (Whole / Total)	2022 Milling % (Whole / Total)	Mean Milling % (Whole / Total)	2020 Grain Yield (lb/A)	2021 Grain Yield (lb/A)	2022 Grain Yield (lb/A)	Mean Grain Yield (lb/A)
Clearfield														
CL111	Long	G	81	41	14.2	MR	66/71	65/70	NA	NA	7,089	7,726	NA	NA
CL151	Long	G	82	40	19.2	S	66/70	62/69	NA	NA	7,150	7,779	NA	NA
CL153	Long	G	83	40	13.1	MR	65/70	63/69	59/70	62/70	7,175	8,370	9,030	8,192
CLL16	Long	G	87	43	16.1	R	58/67	54/65	54/68	55/67	8,041	9,461	9,716	9,072
CLL19	Long	G	80	38	20.1	MR	64/70	60/67	55/69	60/69	7,456	8,651	9,588	8,565
CLM04	Med.	G	87	42	12.8	MR	64/68	63/68	61/70	63/69	8,009	8,612	8,953	8,525
Provisia														
PVL03	Long	G	80	41	8.8	MR	60/72	62/70	59/69	60/70	8,388	7,497	8,562	8,149

Abbreviations: VG = very good, G = good, R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, VS = very susceptible.
Height: Height maturity in inches from soil line to extended panicle.
Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.

Table 3. 2023 Louisiana Variety Test (VT) | CONTINUES ON PAGE 6

Variety	Herbicide Type	Days to 50% Heading	Height (in)	Milling % (Whole / Total)	Chalk (%)	Grain Length (mm)	Lodging % Observed	RRS-SF 3/3	RRS 3/9	MM 3/13	MW 3/14	LK 3/15	PL 3/30	WB 4/19	VT Avg. Yield (lb/A)
Aromatic															
ARoma22	CONV	89	42	59/70	13.2	6.7	0.0	7,927	9,399	7,834	5,711	7,204	6,010	7,427	7,359
CLJ01	CL	87	38	66/72	10.7	6.7	0.0	9,594	9,034	8,601	7,083	7,275	7,531	3,324	7,492
Jazzman	CONV	90	38	60/69	17.0	6.5	0.0	8,372	8,262	7,735	6,083	8,012	5,315	5,326	7,015
RU2002166	CONV	83	37	57/70	17.3	6.6	0.0	11,307	7,930	8,179	7,097	8,637	7,071	6,844	8,152

CONTINUED | Table 3. 2023 Louisiana Variety Test (VT).

Variety	Herbicide Type	Days to 50% Heading	Height (in)	Milling % (Whole / Total)	Chalk (%)	Grain Length (mm)	Lodging % Observed	RRS-SF 3/3	RRS 3/9	MM 3/13	MW 3/14	LK 3/15	PL 3/30	WB 4/19	VT Avg. Yield (lb/A)
Long Grain															
AddiJo (HA)	CONV	90	38	54/69	30.0	6.6	0.0	10,261	9,012	10,065	7,118	8,347	5,977	7,564	8,335
Avant	CONV	79	35	61/71	29.2	6.6	0.0	10,323	9,744	10,449	8,664	9,152	8,666	7,765	9,252
Cheniere	CONV	87	37	62/72	18.8	6.6	0.0	9,640	7,696	8,441	6,457	7,895	6,106	8,149	7,769
CL153	CL	84	38	59/70	22.1	6.5	0.0	11,001	11,097	10,283	8,086	8,567	8,731	5,447	9,030
CLHA02 (HA)	CL	86	37	57/69	32.7	6.3	0.0	10,147	10,097	10,433	8,433	9,385	9,010	8,654	9,451
CLL16	CL	91	41	54/68	26.9	6.6	6.7	10,953	10,044	11,033	8,095	9,236	8,937	9,714	9,716
CLL17	CL	85	38	58/69	28.4	6.3	0.0	11,923	12,314	10,515	7,497	9,189	7,780	3,744	8,995
CLL18	CL	88	41	47/67	40.5	6.4	1.3	11,150	11,958	11,736	9,705	11,659	9,862	10,495	10,938
CLL19	CL	82	36	55/69	33.2	6.4	2.0	11,925	11,277	10,866	8,591	9,345	9,563	5,550	9,588
DG263L (HA)	CONV	85	38	57/68	31.2	6.0	16.7	10,065	9,241	11,616	8,733	10,068	10,601	10,320	10,092
DG3H2004 (H)	CONV	90	42	57/68	38.0	6.5	11.3	11,761	12,041	13,255	9,669	12,919	12,450	11,986	12,012
DG3H2007 (H)	CONV	89	41	51/68	41.9	6.4	16.0	9,801	11,197	11,532	10,195	13,930	12,250	11,337	11,463
DG3H20363 (H)	CONV	88	42	56/69	38.1	6.5	10.0	11,435	12,830	13,462	10,006	13,822	12,547	11,464	12,224
DG3H20397 (H)	CONV	89	42	54/69	32.5	6.7	1.3	11,056	12,164	10,968	9,995	11,331	11,166	10,382	11,009
DG3H20402 (H)	CONV	89	41	55/69	30.7	6.8	2.0	9,689	11,523	12,974	9,490	12,664	11,122	10,435	11,128
Mermentau	CONV	83	38	59/70	35.9	6.5	0.0	12,269	8,925	9,382	7,854	8,357	7,702	5,351	8,549
Ozark	CONV	87	38	50/68	37.4	6.3	0.0	11,309	9,237	10,026	9,168	10,463	8,203	9,911	9,760
PVL03	PV	84	40	55/71	30.6	6.7	0.0	10,961	9,879	12,747	8,668	10,286	8,642	8,314	9,928
PVL04	PV	88	39	56/69	28.7	6.9	0.0	9,474	10,059	9,307	7,690	9,324	8,378	1,051	7,898
RT7302 (H)	CONV	83	43	56/71	37.2	6.7	14.7	14,384	12,630	14,060	11,227	12,743	11,826	10,792	12,523
RT7331MA (H)	MA	82	43	55/71	36.9	6.5	0.0	12,010	12,473	12,149	11,660	13,644	10,956	9,781	11,810
RT7421FP (H)	FP	85	46	52/70	30.6	6.5	17.3	12,834	13,114	13,463	11,381	12,315	11,479	11,245	12,262
RT7431MA (H)	MA	83	42	57/70	27.8	6.5	14.0	12,694	10,589	13,862	10,749	13,246	11,459	10,800	11,914
RU1902207	CONV	83	38	58/71	29.8	6.6	0.0	11,089	8,942	8,676	6,626	8,108	7,599	3,167	7,744
RU2102150 (HA)	CL	85	38	61/69	27.2	6.3	0.0	11,841	9,352	9,500	7,994	8,963	9,050	5,260	8,851
RU2102186	PV	84	39	56/69	32.0	6.6	1.3	11,240	8,975	9,566	8,805	10,210	8,529	9,492	9,545
RU2102217	CL	81	36	45/70	41.4	6.6	0.0	11,774	10,970	10,491	8,697	9,963	10,039	8,713	10,092
RU2301022	CL	88	36	61/71	31.3	6.5	0.0	9,321	9,819	9,809	8,857	8,825	7,952	8,963	9,078
XP781 (H)	CONV	89	44	56/70	31.0	6.5	14.7	11,810	11,370	11,814	10,958	11,661	10,691	11,498	11,400
Medium Grain															
BBC30-1	CL	88	33	56/70	22.7	6.0	0.0	10,159	10,285	9,461	7,610	7,714	5,953	7,523	8,386
CLM04	CL	89	40	61/70	18.7	5.9	0.0	9,289	9,761	10,143	9,000	8,803	7,038	8,640	8,953
CLM05	CL	89	37	58/68	28.9	6.3	0.0	11,121	10,423	10,215	8,119	10,352	8,562	9,666	9,780
DG353M	CONV	87	35	54/70	26.7	5.9	0.0	8,672	7,074	6,796	7,215	6,931	5,100	7,546	7,048
Jupiter	CONV	91	34	56/68	32.8	5.8	0.0	7,561	6,550	6,293	6,961	7,678	3,625	7,559	6,604
RT3202 (H)	CONV	78	40	55/70	29.5	5.9	8.0	12,175	10,405	12,392	8,710	12,058	10,814	8,869	10,775
RU1901165	CONV	88	34	58/69	20.1	5.7	0.0	11,289	8,444	8,880	8,860	8,248	6,422	8,832	8,711
RU2102066	CONV	86	34	52/69	27.2	5.8	0.0	8,828	7,606	8,650	7,318	7,191	5,217	7,919	7,533
RU2102070	CONV	84	35	57/69	26.9	5.8	0.0	11,033	8,466	7,438	8,110	9,073	6,370	8,028	8,360
Taurus	CONV	85	33	50/71	18.5	5.7	2.7	9,357	8,783	10,104	8,608	9,710	8,675	8,981	9,174
Titan	CONV	83	34	55/69	27.0	5.9	0.0	9,888	9,096	7,600	7,352	7,829	5,215	7,279	7,751

Abbreviations: (H) = Hybrid, (HA) = High Amylose, (A) = Aromatic, CL = Clearfield, CONV = Conventional, FP = FullPage, MA = Max-Ace, PV = Provisia.

Height: Height maturity in inches from soil line to extended panicle.

Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.

Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.

RRS-SF: Crowley, Louisiana, South Farm; RRS: Crowley, Louisiana; MM: Mamou, Louisiana; MW: Mowata, Louisiana; LK: Lake Arthur, Louisiana; PL: Palmetto, Louisiana; WB: Winnsboro, Louisiana.

Planting date listed under location of trial; month/day of 2023.

Table 4. 2023 Pre-Commercial (PC) Trial (SW LA/TX).

Variety	Herbicide Type	Days to 50% Heading	Height (in)	Milling % (Whole/Total)	Chalk (%)	Grain Length (mm)	Lodging % Observed	RRS 2/27	RRS-SF 3/3	RRS 2 3/9	MM 3/13	LK 3/15	RRSL 4/20	TX BCTY 4/4	TX NAS 4/20	TX WRRS 4/25	PC Avg-Yield (lb/A)
Long Grain																	
201L1251	CONV	88	36	47/69	32.8	6.3	0.0	8,500	10,596	9,031	9,696	8,886	8,600	7,404	5,388	8,725	8,536
203L1104	PV	90	37	62/71	25.8	6.7	0.0	8,051	10,368	9,713	9,394	9,087	7,939	8,186	5,694	8,819	8,583
22AR147	CONV	86	39	48/68	37.2	6.2	0.0	7,611	10,976	7,251	10,259	9,744	10,269	9,942	6,845	9,982	9,209
22DGL264	CONV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
23AR2205	PV	90	37	59/68	35.1	6.0	2.0	8,508	10,670	5,701	10,849	6,398	7,787	7,891	NA	8,182	8,248
CLL16	CL	91	41	53/67	30.0	6.5	2.0	8,453	10,726	9,337	10,864	9,812	7,911	8,843	5,580	9,309	8,982
CLL18	CL	87	40	49/66	37.8	6.4	2.4	9,380	11,927	10,898	15,985	10,701	9,916	8,268	5,656	9,044	10,197
CLL19	CL	83	36	55/69	31.5	6.3	0.0	8,593	11,164	11,280	10,757	9,284	8,448	7,863	6,032	8,414	9,093
DG263L (HA)	CONV	86	38	58/67	28.2	6.0	11.2	8,832	11,471	8,085	10,650	11,109	9,319	9,324	4,990	9,249	9,225
DG3H2004 (H)	CONV	88	40	56/68	36.0	6.4	7.6	10,382	12,951	10,730	13,177	13,317	11,313	10,989	5,862	10,643	11,040
DG3H2007 (H)	CONV	88	40	53/67	39.0	6.4	6.8	10,091	12,243	11,234	12,726	13,880	11,769	10,951	5,735	9,985	10,957
DG3H20363 (H)	CONV	88	41	55/67	37.3	6.4	12.8	10,416	13,375	11,430	13,089	14,011	12,341	12,004	6,544	6,937	11,127
DG3H20401 (H)	CONV	81	40	54/69	29.6	6.8	0.0	NA	NA	NA	13,306	11,646	10,182	11,542	5,768	11,198	10,607
DG3H20402 (H)	CONV	89	40	55/69	30.0	6.8	0.0	9,612	12,542	11,409	11,852	12,574	11,011	11,083	5,576	11,019	10,742
PVL03	PV	86	39	52/70	29.6	6.6	4.0	8,350	11,219	9,064	10,379	10,143	7,941	7,516	4,879	7,582	8,564
PVL04	PV	89	38	55/68	29.1	6.8	0.0	7,770	10,077	8,856	11,527	10,052	8,405	7,962	3,501	8,197	8,483
RU2102150 (HA)	CL	86	38	60/69	26.5	6.4	0.0	8,242	10,097	10,133	9,832	9,433	8,747	7,172	5,896	8,795	8,705
RU2102186	PV	86	38	56/70	30.0	6.7	0.0	8,125	10,780	8,066	10,190	10,363	8,550	8,107	4,552	7,574	8,479
RU2102217	CL	83	35	41/69	39.3	6.4	0.0	8,779	10,833	9,814	11,983	10,011	9,314	7,639	NA	8,969	9,668
RU2201020	CONV	87	40	46/68	43.2	5.8	1.2	8,040	12,365	8,242	12,080	9,457	9,684	7,458	5,452	8,374	9,017
RU2301022	CL	87	36	60/71	28.6	6.4	0.0	6,945	10,929	9,960	10,429	8,982	7,325	8,264	4,739	8,387	8,440
XP753 (H)	CONV	83	42	50/69	34.4	6.5	0.0	11,748	13,356	10,887	14,065	12,215	11,024	11,415	6,455	11,096	11,362
Medium Grain																	
CLM05	CL	91	36	57/67	26.8	6.2	0.0	9,818	12,024	10,163	10,623	8,845	9,544	7,773	4,207	9,075	9,119
Jupiter	CONV	91	34	59/67	33.4	5.7	0.4	7,155	9,210	5,585	7,345	7,741	6,266	7,864	NA	7,737	7,363
RU2102070	CONV	87	36	58/68	27.9	5.8	2.0	6,917	11,891	6,441	9,002	7,983	7,189	7,846	4,717	8,183	7,797
RU2202037	CL	86	38	60/68	22.6	5.7	0.0	8,628	11,341	9,686	9,004	7,950	6,681	7,854	5,975	8,034	8,350

Abbreviations: (H) = Hybrid, (HA) = High Amylose, (A) = Aromatic, CL = Clearfield, CONV = Conventional, FP = FullPage, MA = Max-Ace, PV = Provisia.

Height: Height maturity in inches from soil line to extended panicle.

Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.

Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.

LK: Lake Arthur, Louisiana; MM: Mamou, Louisiana; RRS_2: Crowley, Louisiana, second planting; RRSL: Crowley, Louisiana, Late planting; RRS-SF: Crowley, Louisiana, South Farm; TX-BCTY:

Texas, Bay City; TX-NAS: Texas, Nutrien Rice Breeding Station; TX-WRRS: Texas, Wintermann Rice Research Station.

Planting date listed under location of trial; month/day of 2023.

Table 5. 2023 Pre-Commercial (PC) Trial (NE LA/AR).

Variety	Herbicide Type	Days to 50% Heading	Height (in)	Lodging % Observed	PL 3/30	WB 4/19	SJ 5/4	RIC 5/22	SJ 2 5/23	AR RREC 1 3/29	AR LAW 4/12	AR JAC 4/18	AR PTRS 1 4/19	AR DES 4/19	AR NERice1 4/24	AR NERice2 4/26	AR PTRS 2 5/3	AR NEREC1 5/4	AR NEREC2 5/4	AR RREC 2 5/23	AR RREC 3 5/30	PC Avg. Yield (lb/a)
Long Grain																						
201L1251	CONV	87	35	0.0	8,266	9,730	7181	6,944	7820	7915	8,379	7,500	10,419	6,963	7,568	10,236	8,017	7138	7430	10,152	7,304	8,174
203L1104	PV	89	34	0.0	8,316	4,490	6,992	7,450	6,717	7,455	6,840	7,363	9,172	7,007	6,720	8,650	6,745	6,462	7,357	7,975	6,026	7161
22AR147	CONV	84	39	0.0	9,324	9,774	6,969	7,596	5,762	8,772	8,876	9,413	10,953	7,756	8,126	11,202	8,089	7,856	7,986	10,141	7,758	8,609
22DGL264	CONV	84	41	0.0	NA	NA	NA	NA	NA	9,965	NA	NA	11,522	NA	NA	11,939	NA	NA	10,561	11,063	NA	11,010
23AR2205	PV	85	37	0.0	8,236	9,216	6,876	6,240	8,215	7,355	7,745	8,318	10,047	6,991	7,892	10,021	7,477	7,304	8,518	9,310	6,839	8,035
CLL16	CL	89	39	0.0	9,409	9,532	6,820	9,232	8,396	7,959	8,519	7,830	10,185	6,927	7,999	10,525	7,824	7,278	8,053	9,545	7122	8,421
CLL18	CL	87	38	0.0	9,419	11,240	6,384	6,495	7,514	8,687	8,374	8,774	11,898	7,346	8,233	10,714	7,969	7,974	8,103	10,637	7,251	8,648
CLL19	CL	83	35	0.0	9,593	6,486	6,706	9,357	7,072	8,035	8,604	7,415	9,782	7,278	7,665	9,639	8,055	7,169	7,384	9,829	7,178	8,073
DG263L (HA)	CONV	80	36	0.0	10,683	10,676	7,693	9,963	6,794	8,819	9,847	8,102	10,243	7,542	8,980	9,888	8,095	8,121	8,575	9,353	6,693	8,827
DG3H2004 (H)	CONV	84	39	0.0	11,144	13,510	9,294	7,072	4,918	10,921	9,772	9,937	12,088	9,706	9,681	10,758	9,601	9,401	11,435	11,363	8,703	9,959
DG3H2007 (H)	CONV	85	39	1.5	11,729	12,654	8,921	5,863	7,150	11,087	10,041	9,909	12,322	10,120	9,449	12,245	9,655	8,897	10,507	11,864	8,761	10,069
DG3H20363 (H)	CONV	85	39	0.0	12,610	12,913	9,266	5,693	7,524	11,253	10,413	9,821	12,883	10,392	9,930	12,095	9,468	9,602	10,978	12,012	8,871	10,337
DG3H20401 (H)	CONV	84	38	0.0	12,001	11,908	9,340	6,779	5,802	NA	10,064	9,819	NA	9,795	9,364	NA	8,939	8,553	NA	NA	8,801	9,264
DG3H20402 (H)	CONV	85	39	0.0	11,806	11,786	7,472	7,984	8,062	9,943	9,909	9,600	12,032	9,641	9,219	12,000	9,122	9,414	10,807	11,127	8,846	9,928
PVL03	PV	86	37	0.0	8,485	8,907	6,164	6,110	7,138	6,897	8,208	6,745	9,298	7,264	6,832	8,937	7,193	6,389	6,924	8,616	6,877	7,470
PVL04	PV	88	37	1.1	8,972	2,587	6,054	6,093	5,255	7,427	7,303	7,279	9,334	5,800	7,374	9,501	7,595	7,525	7,998	9,183	6,393	7,157
RU2102150 (HA)	CL	86	37	0.0	9,582	5,741	6,668	5,322	7,643	8,095	7,875	6,973	9,886	7,263	7,551	9,519	7,896	7,032	6,463	8,940	7,003	7,615
RU2102186	PV	86	37	0.0	8,854	9,041	5,777	7,248	7,239	7,459	6,806	6,349	8,850	7,160	7,084	8,249	6,515	6,517	6,509	8,544	6,563	7,339
RU2102217	CL	82	34	0.0	10,658	9,051	7,228	6,937	6,425	8,712	8,764	7,721	10,766	6,676	8,154	10,533	8,238	7,164	7,457	9,781	7,448	8,336
RU2201020	CONV	85	39	0.0	7,784	10,176	7,226	6,631	4,188	8,574	8,329	8,582	10,518	6,757	7,752	11,026	7,785	7,136	7,581	9,880	7,367	8,076
RU2301022	CL	88	35	0.0	10,528	9,450	4,265	6,924	4,315	6,234	9,420	8,161	10,385	7,144	7,450	10,451	7,606	6,550	7,879	9,875	7,631	7,898
XP753 (H)	CONV	81	40	0.0	10,125	11,243	7,914	6,885	5,653	9,219	10,621	9,899	12,592	8,593	9,757	13,265	8,990	7,808	9,125	11,666	8,143	9,500
Medium Grain																						
CLM05	CL	87	37	0.0	11,545	10,110	7,652	7,026	5,949	10,423	8,423	7,149	10,213	7,119	8,432	9,396	7,401	7,238	8,804	10,423	7,432	8,514
Jupiter	CONV	87	36	0.0	9,068	7,908	5,503	8,338	6,059	9,238	7,195	7,688	8,048	5,682	7,146	8,978	6,718	5,736	7,455	9,238	6,133	7,419
RU2102070	CONV	82	37	0.0	8,175	8,938	6,889	8,829	8,048	9,224	8,891	8,506	10,459	6,845	8,076	10,102	7,429	7,043	8,005	9,224	7,345	8,355
RU2202037	CL	84	36	2.4	9,963	8,388	6,288	5,676	9,232	9,298	7,559	7,949	9,148	6,631	7,517	9,620	6,515	5,958	6,636	9,298	5,854	7,737

Abbreviations: (H) = Hybrid, (HA) = High Amylose, (A) = Aromatic, CL = Clearfield, CONV = Conventional, FP = FullPage, MA = Max-Ace, PV = Provisia.

Height: Height maturity in inches from soil line to extended panicle.

Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.

PL: Palmetto, Louisiana; WB: Winnsboro, Louisiana; RIC: Richland, Louisiana; SJ: St. Joseph, Louisiana; SJ 2: St. Joseph, Louisiana, second planting; AR-RREC 1: First test Stuttgart, Arkansas; AR-RREC 2: Second test Stuttgart, Arkansas; AR-RREC 3: Third test Stuttgart, Arkansas; AR-PTRS 1: First test Pine Tree, Arkansas; AR-PTRS 2: Second test Pine Tree, Arkansas; AR-DES: Desha County, Arkansas; AR-NERec: Lawrence County, Arkansas; AR-NERec1: First test Northeast Rice Research and Extension Center, Arkansas; AR-NERec2: Second test Northeast Rice Research and Extension Center, Arkansas; AR-NERec3: First test Northeast Rice Research and Extension Center, Arkansas; AR-NERec4: Second test Northeast Rice Research and Extension Center, Arkansas.

Planting date listed under location of trial; month/day of 2023.

Table 6. 2023 Conventional Advanced Yield Trial (AYT).

Variety	Days to 50% Heading	Height (in)	Milling % (Whole / Total)	Chalk (%)	Grain Length (mm)	Lodging % Observed	RRS 2/27	RRS-SF 3/3	LK 3/15	PL 3/30	SJ 5/4	RRSL 4/19	WB 4/19	AYT Avg. Yield (lb/A)
Long Grain														
201L1251	90	38	48/69	31.9	6.4	0.0	9,267	11,080	9,670	7,887	5,308	8,784	9,578	8,796
211L1008	84	38	62/71	29.8	6.7	0.0	9,566	11,404	10,104	7,814	5,291	8,527	8,222	8,704
211L1032	88	38	62/71	31.7	6.8	0.0	8,664	10,619	8,794	7,514	4,084	9,105	9,168	8,278
211L1056	88	37	57/71	29.8	6.4	0.0	8,397	11,240	9,285	7,921	5,310	8,499	9,940	8,656
211L1331	93	40	60/70	21.7	6.6	0.0	8,814	10,089	9,358	6,948	5,531	8,924	6,115	7,968
Avant	81	36	63/72	25.8	6.7	0.0	9,002	10,012	9,702	7,927	5,961	9,045	7,990	8,520
Cheniere	91	39	65/73	15.1	6.7	0.0	7,673	9,577	8,298	5,549	4,308	7,179	8,235	7,260
DG263L (HA)	88	39	60/68	29.3	6.1	6.1	9,254	10,408	10,672	8,969	5,931	9,488	9,978	9,243
RU1902207	87	39	60/71	30.3	6.6	0.0	8,357	11,361	9,393	6,813	4,063	7,936	2,964	7,269
Medium Grain														
Jupiter	92	35	63/68	32.7	5.7	0.0	8,273	9,177	5,943	3,102	3,644	5,911	8,039	6,299
RU2102066	90	35	64/69	29.8	5.7	0.0	8,882	10,784	7,677	4,399	4,470	7,293	8,815	7,474
RU2102070	87	37	63/69	27.0	5.9	0.0	9,385	12,164	9,566	5,546	4,758	7,198	8,575	8,170
RU2201020	87	41	47/69	44.7	5.8	0.0	9,632	11,768	9,394	6,559	5,572	10,920	10,311	9,165

Abbreviations: (HA) = High Amylose.
Height: Height maturity in inches from soil line to extended panicle.
Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.
RRS: Crowley, LA; RRSL: Crowley, LA, Late planting; RRS-SF: Crowley, LA, South Farm; LK: Lake Arthur, LA; PL: Palmetto, LA; SJ: St. Joesph, LA; WB: Winnsboro, LA.
Planting date listed under location of trial; month/day of 2023.

Table 7. 2023 Clearfield Advanced Yield Trial (AYT).

Variety	Days to 50% Heading	Height (in)	Milling % (Whole / Total)	Chalk (%)	Grain Length (mm)	Lodging % Observed	RRS 3/1	RRS-SF 3/3	MM 3/13	LK 3/15	PL 3/30	RRSL 4/18	WB 4/19	SJ 5/4	AYT Yield Avg. (lb/A)
Long Grain															
202L2082 (HA)	89	40	55/71	21.9	6.7	0.0	8,600	10,181	8,787	6,640	6,189	6,525	6,273	5,018	7,276
202L2096 (A)	91	42	61/70	18.1	6.9	3.3	8,670	9,822	9,962	8,311	7,073	7,489	9,878	6,110	8,414
202L2141 (HA)	91	41	53/68	29.0	7.1	0.0	9,370	8,889	10,651	7,931	6,888	6,843	8,035	6,360	8,121
212L2252 (A)	86	39	63/71	16.8	7.0	0.0	9,005	9,293	9,285	8,234	7,801	7,923	7,426	5,049	8,002
CLHA03 (HA)	87	39	61/70	30.2	6.5	0.0	9,774	9,578	9,386	8,305	8,386	6,837	6,863	6,179	6,886
CLJ01 (A)	88	40	65/71	10.8	6.8	0.0	8,008	7,758	8,400	6,892	6,923	7,956	5,262	5,004	8,846
CLL16	91	42	53/68	29.0	6.7	0.0	8,732	10,545	10,419	7,371	7,268	9,956	10,672	7,805	9,855
CLL18	88	42	49/67	38.7	6.6	0.0	9,722	10,808	11,485	10,498	8,509	8,464	11,356	6,510	8,964
CLL19	85	37	55/70	36.0	6.5	0.0	9,784	10,871	10,245	9,266	8,395	8,587	7,902	6,788	8,860
RU1902034	86	39	56/70	39.8	6.6	0.0	9,864	10,327	10,363	9,053	8,109	8,909	8,642	5,938	9,108
RU2101208 (A)	88	40	56/69	26.143	7.1	0.0	9,818	10,309	10,190	6,916	9,845	8,335	9,030	7,850	8,351
RU2102217	85	36	45/70	43.9	6.6	0.0	9,681	10,980	9,446	8,861	9,188	8,894	10,355	7,121	9,316
RU2102222	87	36	61/72	21.0	6.8	0.0	9,885	10,455	9,795	8,524	7,423	8,277	10,648	6,451	8,932
Medium Grain															
212M1076	87	38	63/72	26.0	5.9	0.0	9,650	9,556	10,424	8,383	6,459	7,805	8,424	6,529	8,242
212M1144	88	40	61/70	27.0	6.1	0.0	10,098	10,722	9,905	8,442	6,888	8,628	9,591	6,630	9,203
CLM04	90	41	64/71	22.2	6.0	3.1	9,611	9,459	9,187	7,500	5,747	8,354	9,776	6,848	8,472
CLM05	91	38	61/69	28.9	6.3	0.0	10,106	10,892	9,947	9,283	7,249	9,190	10,158	7,362	8,933

Abbreviations: (HA) = High Amylose; (A) = Aromatic.
Height: Height maturity in inches from soil line to extended panicle.
Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.
RRS: Crowley, LA; RRSL: Crowley, LA, Late planting; RRS-SF: Crowley, LA, South Farm; LK: Lake Arthur, LA; PL: Palmetto, LA; MM: Mamou, LA; SJ: St. Joseph, LA; WB: Winnsboro, LA
Planting date listed under location of trial; month/day of 2023.

Table 8. 2023 Provisia Advanced Yield Trial (AYT).

Variety	Days to 50% Heading	Height (in)	Milling % (Whole/Total)	Chalk (%)	Grain Length (mm)	Lodging % Observed	RRS 2/28	RRS-SF 3/3	MM 3/13	LK 3/15	PL 3/30	RRSL 4/14	WB 4/19	SJ 5/4	AYT Yield Avg. (lb/A)
Long Grain															
203L1104	92	38	64/72	23	6.9	0.0	9,170	10,099	9,967	10,525	6,217	9,636	4,519	5,607	8,218
213L1041	85	41	57/72	32	6.7	0.0	8,839	11,865	10,322	9,987	6,697	8,777	3,493	4,569	8,069
213L1130	91	39	59/71	29	7.3	0.0	8,857	11,234	10,644	10,083	5,870	9,646	8,683	3,891	8,614
213L1140	87	39	53/71	25	7.0	0.0	8,965	10,948	10,837	11,132	6,282	9,193	8,974	4,542	8,859
213L1268	84	38	50/71	33	6.7	0.0	8,175	11,045	9,463	10,404	5,914	9,216	7,815	4,227	8,282
PVL03	86	41	56/72	29	6.9	0.0	9,340	10,563	9,843	9,673	6,569	8,974	8,354	5,062	8,547
PVL04	90	40	57/70	25	7.0	0.0	8,343	9,077	10,749	9,426	6,340	8,737	823	5,467	7,370
RU2102186	86	40	57/71	30	6.9	0.0	8,985	11,265	10,522	10,687	6,956	9,116	8,903	4,308	8,843
RU2102186	86	40	57/71	30	6.9	0.0	8,985	11,265	10,522	10,687	6,956	9,116	8,903	4,308	8,843

Height: Height maturity in inches from soil line to extended panicle.
Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.
RRS: Crowley, LA; RRSL: Crowley, LA. Late planting; RRS-SF: Crowley, LA. South Farm; LK: Lake Arthur, LA; PL: Palmetto, LA; MM: Mamou, LA; SJ: St. Joseph, LA; WB: Winnsboro, LA.
Planting date listed under location of trial; month/day of 2023.

Table 9. 2023 Date of Planting (DOP) Trial.

Variety	Herbicide Type	Grain Type	Days to 50% Heading	Height (in)	Milling % (Whole/Total)	Chalk (%)	Grain Length (mm)	Lodging % Observed	DOP 1 2/27	DOP 2 3/13	DOP 3 3/27	DOP 4 4/14	DOP 5 4/25	DOP 6 5/12	DOP 7 5/26	DOP 8 6/9	DOP 1 -DOP 8 Avg. (lb/A)	DOP 1 -DOP 4 Avg. (lb/A)
201L1251	CONV	Long	81	35	51/70	30.6	6.4	0.0	9,325	8,944	8,548	10,742	9,101	7,026	3,156	6,547	7,924	9,390
203L1104	PV	Long	83	35	65/72	22.1	6.8	0.0	9,263	9,065	8,669	10,145	8,629	7,091	5,918	6,427	8,151	9,286
Avant	CONV	Long	73	35	62/71	27.8	6.6	0.0	9,685	9,937	9,753	11,123	9,617	8,227	5,909	6,869	8,890	10,125
CLL18	CL	Long	79	38	50/66	37.4	6.4	0.0	11,662	10,993	11,218	11,549	9,879	7,817	7,188	8,041	9,793	11,356
CLL19	CL	Long	77	34	57/69	31.9	6.4	0.0	9,946	10,432	9,629	11,562	9,298	8,033	6,197	6,775	8,984	10,392
Jupiter	CONV	Med	84	33	62/67	33.3	5.6	0.0	9,391	9,172	7,164	7,297	4,902	7,108	568	3,484	6,136	8,256
PVL03	PV	Long	79	37	55/70	28.3	6.6	0.0	8,779	9,002	8,454	9,295	7,714	5,614	3,165	4,293	7,040	8,883
RU1902207	CONV	Long	79	36	61/71	29.6	6.5	0.0	8,878	8,460	8,403	9,955	8,024	6,467	2,457	5,130	7,222	8,924
RU2002166 (A)	CONV	Aro	79	35	65/72	19.3	6.8	0.0	9,451	8,285	8,192	9,994	7,144	4,853	2,772	4,146	6,855	8,981
RU2102066	CONV	Med	81	32	63/68	31.0	5.6	0.0	9,359	8,922	7,773	8,663	5,123	6,125	532	2,115	6,077	8,679
RU2102070	CONV	Med	80	35	63/68	29.0	5.8	0.0	9,315	8,169	8,232	9,291	5,564	7,106	391	2,838	6,363	8,752
RU2102150 (HA)	CL	Long	80	36	63/69	24.5	6.4	0.0	9,753	9,370	8,790	9,943	8,428	7,366	5,954	7,295	8,362	9,464
RU2102217	CL	Long	76	33	43/69	42.8	6.4	0.0	9,486	10,229	10,667	11,372	9,582	6,600	6,565	7,152	8,957	10,439

Abbreviations: (HA) = High Amylose, (A) = Aromatic, CL = Clearfield, CONV = Conventional, FP = FullPage, MA = Max-Ace, PV = Provisia, Med = Medium, Aro = Aromatic.
Height: Height maturity in inches from soil line to extended panicle.
Chalk: Total percentage area of grain with chalk as determined by SeedCount image analyzer.
Lodging: Comparative estimate of resistance to lodging. Most varieties rated as resistant can lodge, especially under excessive levels of nitrogen.
Grain Traits: Average across trials
DOP 1 - DOP 4 Average represents plantings in recommended planting window.

SEEDING RATES

Establishing a satisfactory stand is an essential first step in a successful rice production program. The number 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 pre-sprouted 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 optimal stand is 10 to 15 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 Jupiter will contain fewer seeds than 90 pounds of CLL17. For conventional varieties, an ideal plant population is approximately 10 to 15 plants per square foot. Seeding rates of hybrids are much lower than inbred varieties. Growers should consult their 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 to 15 plants per square foot, approximately 20 to 30 seeds per square foot will have to be planted. Use the information in Table 11 to determine the pounds of seed per acre required to achieve the desired plant population.

When drill seeding, about 50 to 80 pounds of seed per acre are required. When water seeding or dry broadcasting, about 80 to 120 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

- 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, which 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 11 shows seed weight per pound and the average number of seeds 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 and consider using a bird-repellent seed treatment.
- d. Where seedbed preparation is difficult and a less than optimal seedbed is prepared, use a higher seeding rate.
- e. If it is necessary to use seed with 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. Pre-sprouted seed typically will lead to better stands than dry (non-pre-sprouted) seeds.
- i. Per acre rates of the insecticidal seed treatments Cruiser, NipsIt, and Fortenza vary with seeding rates, and efficacy is reduced at lower rates.

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 varieties, the seeding rate can be decreased by 10% when planting under warm conditions (daily average temperature higher than 70 degrees Fahrenheit). Under cool conditions (daily average temperature of 60 to 70 degrees Fahrenheit), the higher rates are recommended.

RICE GROWTH AND DEVELOPMENT

Rice seed is mostly carbohydrates stored in tissue called endosperm. The embryo makes up most of the rest of the seed. Germination begins with imbibition of water. The seed swells, gains weight, conversion of carbohydrates to sugars begins and the embryo is activated. Nutrition from the endosperm can supply the growing embryo for about three weeks.

In the embryo, two primary structures grow and elongate: the radicle (first root) and coleoptile (protective covering enveloping the shoot). As the radicle and coleoptile grow, they apply pressure to the inside of the hull. Eventually, the hull weakens under the pressure, and the pointed, slender radicle and coleoptile emerge. The appearance of the radicle and coleoptile loosely defines the completion of germination.

Chlorophyll is the green pigment in leaves that absorbs sunlight. The absence of chlorophyll is called chlorosis.

and develops. It is followed in order by the appearance of the collar at the base of the blade then the sheath below the collar. Since growth and development are continuous, by the time the first complete leaf blade has expanded, the tip of the second complete leaf blade is usually already protruding through the top of the sheath of the first complete leaf. The second leaf grows and develops in the same manner as the first. When the second collar is visible above the collar of the first leaf, it is called two-leaf rice.



First emerging rice leaves

Subsequent leaves develop in the same manner, with the number of fully developed leaves being used to describe the seedling stage of growth. This trend is noted for each subsequent leaf until about the ninth complete leaf, after which leaf size either remains constant or decreases. Although a rice plant can produce many (about 15) leaves, as new leaves are produced, older leaves senesce (die and drop off), resulting in a somewhat constant four to five green leaves per shoot at nearly all times in the life of the plant.



Early emerging leaves of rice

Tillers (stools) first appear as the tips of leaf blades emerging from the tops of sheaths of completely developed leaves on the main shoot. This gives the appearance of a complete leaf that is producing more than one blade. This occurs because tillers originate inside the sheath of a leaf just above the point where the sheath attaches at the base of the plant. If the leaf sheath is removed, the bud of a beginning tiller will appear as a small green triangular growth at the base of the leaf. This

bud is called an axillary bud. Tillers that originate on the main shoot in this manner are primary tillers.

If a second tiller appears, it usually emerges from the sheath of the second complete leaf and so on. Consequently, tillers develop on the main shoot in an alternate fashion like the leaves. When the second primary tiller appears, it is called two-tiller rice. The appearance of tillers in this manner usually continues through about fourth or fifth primary tiller.



Rice tiller

Tillers grow and develop in much the same manner as the main shoot, but they lag behind the main shoot in their development. This lag is directly related to the time a tiller first appears. It usually results in tillers producing fewer leaves and having less height and maturing slightly later than the main shoot. The lowest leaves senesce first with the process continuing from the bottom up or from oldest to youngest leaves. From this point on, there is simultaneous senescence of older leaves and production of new leaves. The stem node forms above the uppermost crown node, and a stem internode begins to form between the two nodes. As the stem internode begins to form, chlorophyll accumulates in the tissue below the stem node. This produces green color in that tissue. Cutting the stem lengthwise usually reveals this chlorophyll accumulation as a band or ring. This is commonly called “green ring” and indicates the onset of internode elongation.

The number of internodes that form in the main stem is relatively constant for a variety. Varieties now being grown have five to six internodes above the crown in the main stem. In tillers, fewer internodes may form than in the main stem. The number is highly variable and depends on how much the tiller lags behind the main stem in growth and development.



Example of "green ring" in early crops

The time between seeding and internode formation depends primarily on the maturity of the variety, which is normally controlled by heat unit exposure. It also can be influenced by planting date, plant population, soil fertility, flood depth and weed competition. In general, varieties classified as very early season maturity (head 75 to 79

days after planting) reach first internode about six weeks after planting. Varieties classified as early season maturity (head 80 to 84 days after planting) reach first internode about seven weeks after planting, and varieties classified as midseason maturity (head 85 to 90 days after planting) reach first internode about eight weeks after planting.

The sheath of the flag leaf, known as the boot, encloses the panicle during the elongation of the last two internodes. Not only is the flag leaf the last formed and uppermost leaf on a mature stem, it is also considered to be the most important leaf because the products of photosynthesis from it are most responsible for grain development.

When cells first begin actively dividing in the growing point or apical meristem, the process is called panicle initiation (PI). In very early season varieties, PI and internode elongation (green ring) occur at about the same time. About seven to 10 days after the beginning of active cell division at the growing point, an immature panicle about 1/8 inch long and 1/16 inch in diameter can be seen. At this point, the panicle can be seen inside the stem, resembling a small tuft of fuzz. This is referred to as panicle differentiation (PD) or 2-mm panicle. The panicle, although small, already has begun to differentiate into distinct parts. Under a microscope or good hand lens, the beginnings of panicle branches and florets are recognizable.



2 mm and 4 mm panicles

Booting is the period during which growth and development of a panicle and its constituent parts are completed inside the sheath of the flag leaf. The sheath of the flag leaf is the boot. For convenience, it is divided into three stages: early, middle and late boot.

Heading refers to the extension of the panicle through the sheath of the flag leaf on the main stem. This process is brought about mainly by the gradual and continuous elongation of the uppermost internode. Once the uppermost internode completes elongation, the full length of the panicle and a portion of the uppermost internode are exposed above the collar of the flag leaf. This stem is now fully headed.



Early stage boot

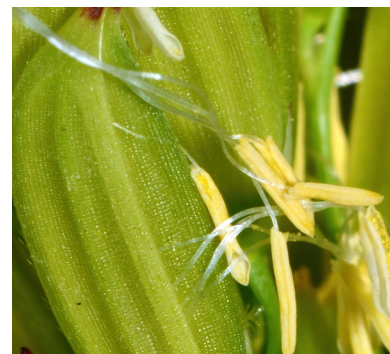
As heading progresses, flowering begins. Flowering, followed by grain fill, begins at the tip of the panicle

then progress to the base. During the middle hours of the day, mature florets open, exposing both the stigmas and anthers to air. Pollen is shed as the anthers dry, split open and spill the pollen. The pollen then is carried by wind to the stigmas of the same or nearby plants. Special cells of the pollen grain join special cells within the pistil, completing fertilization and initiating grain formation.



Late stage boot.

The primary source of the carbohydrate is from photosynthesis occurring in the uppermost three to four leaves and the stem. The carbohydrate that accumulates in grain is stored in the form of starch. Initially, the starch is white and milky inside florets on the main stem, and this is called the milk stage. Since the florets that accumulate carbohydrate first are located near the tip of the panicle, the panicle begins to lean and eventually will turn down. The milky consistency of the starch in the endosperm changes as it loses moisture. When the texture of the carbohydrate of the first florets pollinated on the main stem is like bread dough or firmer, this stage of growth is referred to as the dough stage.



Rice anthesis

When the physiological processes associated with grain filling cease and the collective moisture content of the grain on the main stem is 25% to 30%, the plant has reached physiological maturity. At this time, the endosperm of all grains on the panicle of a main stem is firm.

Most grains are some shades of brown and the grains in the lower quarter of the panicle are the only ones with a greenish tint. As maturity progresses and moisture is lost, the greenish tint of the hulls fades, and the endosperm of all grains becomes uniformly hard and translucent. Once the average moisture content of the grains on the main stem is 15% to 18% (crop grain moisture, 18% to 21%), the plant has reached harvest maturity.

Second crop growth first appears as leaves originating from the crown or a leaf emerging through the sheath of a leaf from the first crop that remains attached to

stubble. This usually occurs within five days after harvest, depending on first crop maturity at harvest.

RICE FERTILIZATION

Fertilizer nutrients are most efficiently used by rice when applied immediately before plant demand. In general, applications of phosphorus, potassium, zinc and sulfur are best utilized when applied during the window from just before planting until the four-leaf stage of development.

There are situations when fall application of some nutrients may be a suitable alternative. For more details, consult the Louisiana Rice Production Handbook, publication No. 2321.

Phosphorus and potassium should be applied according to soil test recommendations. 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 phosphorus and/or potassium will need an additional 30 pounds of phosphorus (as P_2O_5) and/or potassium (as K_2O) to maximize ratoon yields. The additional phosphorus and potassium fertilizer can be applied in the first crop or can be applied after first-crop harvest prior to reflooding.

Lime is not recommended for rice production unless the pH of the soil falls below 5.5. Soybeans grown in rotation with rice 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 zinc deficiency in rice. Lime should be applied in the fall after rice harvest.

In a water-seeded pinpoint flood system, one-third of the crop's nitrogen 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), N-(n-propyl) thiophosphoric triamide (NPPT) or Duromide. The second third of the nitrogen 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 nitrogen should be applied immediately before permanent flood. In order to maximize nitrogen efficiency, the application should be made on dry ground, and the field should be flooded as soon as possible after the application. The balance of the nitrogen should be applied 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, NPPT or Duromide, 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 nitrogen rate range for each commonly grown rice variety is presented in Table 10. Rice varieties may differ in their nitrogen requirements by location. Native soil fertility, soil type and other factors affect nitrogen fertilizer efficiency. Rice growers should determine the nitrogen rate that provides optimal grain yield on their soil and production system. The higher nitrogen rates within the recommended range for each variety are generally required on clay soils in central and northeast Louisiana. Avoid nitrogen deficiency and excessive nitrogen fertilization.

Furrow-irrigated rice (FIR), also known as row rice, often requires 30 to 50 pounds more nitrogen as compared to delayed flood rice due to the reduced nitrogen fertilizer efficiency caused by the frequent wetting and drying of the soil. Nitrogen application in FIR should utilize multiple smaller applications to improve fertilizer efficiency. This fertilization method is often referred to as spoon-feeding rice. Research evaluating the optimal application timings for nitrogen in FIR is currently ongoing; however, preliminary research has shown that nitrogen fertilizer applied in three (spaced 10 to 14 days apart) or four split applications (spaced seven to 10 days apart) with the final application occurring at green ring have both been successful. Urease inhibitors and nitrification inhibitors may be beneficial in FIR in some situations.

Zinc 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 zinc using the Mehlich-3 soil test, it is considered deficient in zinc. Soil pH is also an important factor in determining the potential for zinc deficiency in rice because as soil pH increases above 6, the solubility of zinc begins to decrease. This relationship can cause zinc 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 zinc fertilizer needs in rice. See Table D for zinc fertilizer recommendations. Zinc fertilizer recommendations are based on using a granular zinc sulfate. Other zinc sources can be used; however,

Table 10. Nitrogen Recommendations for Rice Varieties.

Varieties	N rate (lb/A)	OR	Urea (lb/A)
Jupiter	115-140		250-300
AddiJo, Avant Cheniere, CL111, CL153, CLJ01, CLL16*, CLL18*, CLL19, CLM04, Della-2, DG263L, Frontiere, Jazzman, Mermentau, PVL03, Taurus, Titan	140-180		300-400

*Lodging was observed at 180 lb N/A (400 lb urea/A) in some locations.

inorganic zinc sources should be greater than 50% water soluble. Liquid inorganic or chelated zinc fertilizers can be soil applied at lower rates as compared with granular sources, generally between 2.5 to 5 pounds, because they can be applied more uniformly. When zinc 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 zinc application can be applied to rice at rates between 1 and 2 pounds of zinc per acre. Granular zinc applications at this time have also shown to be equally effective. Application of nitrogen fertilizer should also be applied prior to reflooding to account for the nitrogen losses associated with draining.

Ammonium sulfate is generally the preferred nitrogen source in this situation.

Sulfur should be applied according to soil test recommendations. Sulfur deficiencies often show up where large amounts of soil have been moved in land leveling. Sulfur deficiencies resemble nitrogen deficiencies, producing pale yellow plants, which grow slowly. Sulfur deficiency symptoms in rice generally begin with the newest leaf becoming yellow first, while nitrogen 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 nitrogen and 24 pounds of sulfur per acre.

Table 11. Seed per Pound and Average Number of Seed per Square Foot for Important Rice Varieties and Hybrids.

Variety	Seed/ lb*	Seeding Rate 20 (lb/A)	Seeding Rate 25 (lb/A)	Seeding Rate 30 (lb/A)	Seeding Rate 40 (lb/A)	Seeding Rate 50 (lb/A)	Seeding Rate 60 (lb/A)	Seeding Rate 70 (lb/A)	Seeding Rate 80 (lb/A)	Seeding Rate 90 (lb/A)	Seeding Rate 100 (lb/A)	Seeding Rate 110 (lb/A)	Seeding Rate 120 (lb/A)
		-----seed/ft ² -----											
AddiJo	18,307				17	21	25	29	34	38	42	46	50
Avant	19,165				18	22	26	31	35	40	44	48	53
Cheniere	19,657				18	23	27	32	36	41	45	50	54
CL111	18,301				17	21	25	29	34	38	42	46	50
CL153	18,933				17	22	26	30	35	39	43	48	52
CLJ01	19,595				18	22	27	31	36	40	45	49	54
CLL16	17,588				16	20	24	28	32	36	40	44	48
CLL18	19,010				17	22	26	31	35	39	44	48	52
CLL19	19,035				17	22	26	31	35	39	44	48	52
CLM04	18,630				17	21	26	30	34	38	43	47	51
Della-2	17,553				16	20	24	28	32	36	40	44	48
DG263L	18,642				17	21	26	30	34	39	43	47	51
Jazzman	18,117				17	21	25	29	33	37	42	46	50
Jewel	18,771				17	22	26	30	34	39	43	47	52
Jupiter	17,316				16	20	24	28	32	36	40	44	48
Mermentau	20,067				18	23	28	32	37	41	46	51	55
PVL03	17,512				16	20	24	28	32	36	40	44	48
RT 7301	19,557	9	11	13									
RT 7501	19,183	9	11	13									
RT 7321 FP	18,405	8	11	13									
RT 7521 FP	18,584	9	11	13									
RTv 7231 MA	20,491				19	24	28	33	38	42	47	52	56
Taurus	19,443				18	22	27	31	36	40	45	49	54
Titan	16,676				15	19	23	27	31	34	38	42	46
XP753	20,604	9	12	14									

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

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 (ppm)	Low (ppm)	Medium (ppm)	High (ppm)	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		60 lb K_2O / A	40 lb K_2O / A	20 lb K_2O / A	0 lb K_2O / A	0 lb K_2O / A

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

	Very Low (ppm)	Low (ppm)	Medium (ppm)	High (ppm)
Soil Test Ratings	<10	10 - 20	21 - 35	>35
Fertilizer Recommendation	60 lb P_2O_5 / A	40 lb P_2O_5 / A	20 lb P_2O_5 / A	0 lb P_2O_5 / A

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

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

Application of 100 pounds of ammonium sulfate will provide 21 pounds of nitrogen and 24 pounds of sulfur.

Table D. Zinc Fertilizer Recommendations and Soil Test Ratings Based on the Mehlich-3 Soil Test Extraction¹.

Soil Test	≤ 1 ppm		1 - 1.5 ppm			1.6 - 2 ppm	
pH	≥ 7	< 7	> 7	7.0 - 6.0	< 6	≥ 7	< 7
Granular Fertilizer Recommendation ²	15 lb/A	10 lb/A	10 lb/A	5 lb/A	None	5 lb/A	None

¹ The granular zinc fertilizer source must be at least 50% water-soluble 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 nitrogen application using 50 to 100 pounds of ammonium sulfate.

Table 12. Summary of Insecticidal Seed Treatment Characteristics.

Seed Treatment	Active Ingredient	Application Rate	Rice Water Weevil	Stem Borers	Fall Armyworm	Colaspis	Chinch Bugs	Thrips	Aphids	Fungal Pathogens
Dermacor X-100	Chlorantraniliprole	1.5 fl oz/acre	✓	✓	✓	×	×	×	×	×
Cruiser 5FS	Thiamethoxam	3.8 fl oz/cwt*	✓	×	×	✓	✓	✓	✓	×
CruiserMaxx	Thiamethoxam + 3 Fungicides	7.0 fl oz/cwt*	✓	×	×	✓	✓	✓	✓	✓
Fortenza™	Cyantraniliprole	3.47 fl oz/cwt*	✓	×	×	×	×	×	×	×
NipsIt INSIDE	Clothianidin	1.9 fl oz/cwt	✓	×	×	✓	✓	✓	✓	×
NipsIt Suite	Clothianidin + 2 Fungicides	1.9 fl oz/cwt	✓	×	×	✓	✓	✓	✓	✓

*Not to exceed 120 pounds of seed per acre.

™ Research into pest control spectrum is ongoing.

RATOON MANAGEMENT

Ratoon, or second-crop rice, should be fertilized with 90 pounds of nitrogen per acre when the first crop is harvested before Aug. 15. Apply nitrogen and establish a very shallow flood as soon as possible after the first-crop harvest to maximize second-crop yields. Deep initial floods, which can reduce ratoon regrowth, should be avoided. Many growers have found success by harvesting, implementing their preferred stubble management practice, flushing and then applying the nitrogen fertilizer on dry ground followed by establishing a shallow flood. When the main crop is not harvested before Aug. 15, the potential for profitable second-crop production is reduced because of the probable delay in maturity, especially at higher nitrogen rates and the increased likelihood of unfavorable weather. Days to ratoon maturity increase with increasing nitrogen fertilization rates. Therefore, when the first crop is not harvested before Aug. 15, lower nitrogen rates are recommended. A good rule of thumb is to reduce nitrogen by 5 to 6 pounds per day after Aug. 15. Nitrogen fertilizer is not recommended after Sept. 1.

As stated in the fertility section, currently LSU AgCenter soil test-based phosphorus and potassium 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 phosphorus or potassium will need an additional 30 pounds of phosphorus (as P_2O_5) or K (as K_2O) to maximize ratoon yields. The additional phosphorus and potassium fertilizer can be applied with phosphorus and potassium in the first crop or can be applied after first-crop harvest.

Stubble management practices, such as post-harvest mowing of the stubble to approximately 8 inches or post-harvest rolling of the stubble, have shown to increase ratoon yields significantly. Additional benefits of post-harvest stubble management of the rice straw include even maturity of the grain, reduced incidence of disease and increased grain quality. However, it should be noted that post-harvest stubble management practices do delay maturity by approximately two weeks and should be avoided if the main crop is harvested after Sept. 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 management information for these pests is presented in this section, and more detailed descriptions can be found in the LSU AgCenter Louisiana Rice Production Handbook, publication No. 2321. If you suspect insect injury in your field, contact your parish agent for verification and help with damage assessment and insect management. Before applying any insecticides, check the label for potential changes. Detection of residues of unlabeled pesticides including acephate disrupts rice exports.

RICE WATER WEEVIL

The rice water weevil is the most economically important pest of rice in the United States. Adults are grayish-brown 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 yield reduction. Females lay eggs in the leaf sheath at or below the water line beginning soon after permanent flood is applied. The larvae are white, legless grubs (less than 1/4 inch in size) with brown heads that feed on the roots, reducing plant growth and rice yields.



Adult rice water weevil

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 damaging infestations only occur once rice is flooded, and that water-seeded and early flooded rice fields are the most susceptible to yield losses. Delaying application of a permanent flood to rice can reduce yield losses from weevils but may not be compatible with other agronomic practices, particularly weed management. Another key to managing this insect is early planting. 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. Additionally, yield losses from weevil feeding tend to be lower in early-planted rice than in late-planted rice because more mature plants are less susceptible to impacts of root feeding. Seeding conventional rice at low rates (e.g., 20 to 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. Hybrid rice varieties tend to suffer less yield loss than conventional cultivars under comparable infestation levels. 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, Fortenza, Cruiser 5FS and NipsIt INSIDE are insecticidal seed treatments that are applied by the seed dealer. Rates, costs, and the spectrum of pests controlled vary between treatments (Table 12). The active ingredients of NipsIt INSIDE and Cruiser 5FS are also available in combination with fungicide treatments.

Seed treated with Dermacor X-100 may be used in either dry- or water-seeding practices. Fortenza, Cruiser 5FS and NipsIt INSIDE can only be used in rice that is drilled into a dry seedbed. RiceTec hybrid seed often comes pre-treated with one or more of the labeled seed treatments. Check with seed dealers to ensure you know what the rice seed has been treated with. Generally, populations of rice water weevils in southwest Louisiana are high enough that seed treatments are warranted in most fields. Under typical conditions, the cost of seed treatments is offset by the protection of yield from losses due to weevil damage. Weevil management is greatest with Dermacor X-100, which typically exceeds 80% control. Fortenza provides satisfactory control but only achieves 80% control when used in combination with an additional insecticidal seed treatment. Cruiser 5FS and NipsIt INSIDE are less effective (40% to 60% control), and damaging infestations may occur when these products are used under high pest pressure. The spectrum of pests controlled should be a major factor in selecting seed treatments. In southwest Louisiana, where economically damaging infestations of stem borers are prevalent, Dermacor X-100 is recommended. If preventative seed treatments are used, there is little need to scout for rice water weevil adults.

Seeding at low rates (30 to 50 pounds of seed per acre) may compromise the effectiveness of Cruiser 5FS and NipsIt INSIDE seed treatments. If Cruiser 5FS or NipsIt INSIDE are used in fields seeded at low rates, additional management practices should be considered, such as early planting or foliar insecticide applications, if heavy infestations of rice water weevil adults are found.

Management of the rice water weevil with foliar applications of pyrethroid or neonicotinoid insecticides:

Multiple pyrethroid insecticides are labeled for use in rice under variable trade names and formulations. Active ingredients available include: lambda-cyhalothrin, zeta-cypermethrin, gamma-cyhalothrin and alpha-cypermethrin. Trebon (etofenprox) is a granular insecticide with a chemistry similar to the pyrethroids. Belay (clothianidin) is an insecticide that belongs to the neonicotinoid class of insecticides. 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 that of pyrethroids.

All these foliar insecticides only kill adult weevils, not eggs or larvae, so timing of applications is crucial for

management. 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. 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. Oviposition is possible any time water is present in the field, but it is most 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 feeding 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. Trebon should not be applied pre-flood because of the movement of the granules when flood water is applied. More than one application of pyrethroids may be required, especially in late-planted rice. Once fields have been treated, begin scouting again after seven days.

RICE STINK BUG

Rice stink bugs are the greatest threat to headed rice and can reduce yields as well as grain quality. 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 reddish-black just before hatching. 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 arise from reductions in grain quality that result from stink bugs feeding on developing kernels. Pathogens enter the grain at the feeding spot, and the infection and stink bug feeding together cause discolored and pecky rice kernels. Discolored or pecky rice kernels have lower



Adult stink bug



Rice stink bug nymph

grades 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 within each field. Count the number of adults and nymphs collected after every 10 sweeps. In the first two weeks of heading, treat fields when there are 30 or more bugs per 100 sweeps. Insecticides that can be used and the include a variety of pyrethroids neonicotinoid (dinotefuran). TenchuMore mature grain is less susceptible to stink bug damage. From the hard dough stage until two weeks before harvest, treat fields only when there are more than 100 bugs per 100 sweeps. When approaching two weeks before harvest, you can treat with any of the chemicals listed above except for lambda-cyhalothrin and gamma-cyhalothrin, which have 21-day pre-harvest intervals. If pyrethroids fail to provide satisfactory control of stink bugs, switch to another mode of action.

RICE STEM BORERS

The sugarcane borer, rice stalk borer and Mexican rice borer are important pests of rice in some regions in Louisiana. All three species attack rice in southwest Louisiana, but only the sugarcane borer is considered a pest in northeastern Louisiana. The invasive Mexican rice borer is becoming increasingly damaging in southwestern rice areas. All borer species overwinter as mature larvae in the stalks of rice and other host plants. These larvae then pupate, and adult moths emerge in the spring.

Detailed descriptions of the identification, biology and behavior of these stem borers can be found in the Louisiana Rice Production Handbook, publication No. 2321. Although larvae of each species resemble each other, distinguishing characteristics are present. Larvae of the sugarcane borer are cream-colored with a series of brown spots on the back, black bristles and a dark-colored head

		
Rice Stalk Borer 4 solid lines Dark head capsule	Mexican Rice Borer 4 broken lines Light head capsule	Sugarcane Borer Spots and bristles Dark head capsules

Stem borer larvae

capsule. Mexican rice borer larvae are white to honey colored with two pairs of dark brown to purple-colored sporadic stripes running the length of the body.

Rice stalk borer larvae have four solid lines down the body and a dark head capsule. Larvae can attack all stages of rice, but damaging infestations generally occur when rice is in reproductive stages. Larvae emerge within four to five days of egg laying and begin 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. Pupation occurs inside the stem. The pupae are brown, about 1/2 of an inch long and cylindrical. 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 a whitehead. Severe infestations cause stalk breakage and plant lodging above the water surface.

The insecticidal seed treatment Dermacor X-100 has been shown to provide control of stem borers, with reductions in whitehead densities of greater than 70% compared to untreated fields. Use of this product is recommended where rice water weevils are a problem, and problems with stem borers are anticipated.

Scouting for borers should start at green ring and must be intensified as plants reach early boot stages. Look for feeding lesions on the inside surface of the leaf sheath, which are caused by larvae that feed underneath the leaf sheath before boring into the stem. These feeding lesions are easily observed, but care must be taken to avoid confusing these lesions with those caused by sheath blight. Peel back the leaf sheath to expose feeding larvae or the presence of powdery frass to ensure it is a stem borer.

Applications of foliar insecticides must coincide with larval emergence so small larvae are killed before they enter the stems. Once larvae enter the stems, insecticides are ineffective. Pyrethroids are labeled for stem borer control in rice, but no economic thresholds have been developed. 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, sugarcane and grain sorghum, and move to rice plants later in the season. Destruction of rice stubble and weedy grasses 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, 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 seeds within five to seven days after seeding. Monitor fields until rice seedlings are several inches tall. Depending on the severity of



Rice seed midge tunnels in soil

injury, whole fields may need to be replanted, while in some cases, only a portion of the field may require reseeding.

Control the rice seed midge by applying a pyrethroid insecticide 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 (fewer than 15 plants per square foot).

RICE LEAFMINER

Adult flies are metallic, blue-green and less than one-quarter of an inch long. 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 injure the plant by tunneling between the layers of the leaf, attacking and killing leaves closest to the water before moving up the plant and 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 leaves where water is deepest. Scout for rice leafminer larvae by pulling a rice leaf gently between the thumb and forefinger and feeling for the presence of a bump in the leaf. If a bump is detected, the larvae or pupae can be found



Leaf pulled back to expose rice leafminer maggot

by separating the layers of the leaf. If plant populations are being reduced to fewer than 15 plants per square foot, chemical control may be necessary. Insecticide efficacy is not well documented, but pyrethroids will likely provide sufficient control.

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 production regions. Small gray flies (about 1/10 inch long) deposit individual eggs 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,



South American rice miner pupa (top) and larva (bottom)

but heavy infestations have been observed in rice planted in March and April in southwest Louisiana. Injury from the larvae (maggot) 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 seedlings are 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. If the infestation is not too severe and occurs in the tillering stage, rice appears to be able to tolerate some injury without a loss in yield.

No chemicals are currently registered to control SARM. Dermacor X-100 appears to provide some level of protection, but injury to seedlings may still occur. The only recommendation available at this time is to avoid late planting. If you suspect a SARM infestation, contact your parish agent for damage assessment and to obtain the latest developments on this insect pest.

COLASPIS

Colaspis larvae can be found damaging fields of dry-seeded rice in a soybean-rice or 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. Colaspis larvae 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. The larvae pupate in the soil and emerge as adult beetles. Oval-shaped, golden-colored adults have tan stripes running the

length of the body and are about one-quarter of an 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. Cruiser



Colaspis larva in soil

5FS 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 Cruiser 5FS or NipsIt INSIDE may be justified. No foliar insecticides are labeled to control colaspis in Louisiana rice. Applying permanent flood as soon as possible will help control colaspis but may exacerbate weevil damage. Early flooding is only recommended if weevils are controlled. Colaspis larvae are not aquatic, and application of water will decrease feeding injury and eventually cause death of the larvae.

FALL ARMYWORM

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 a pyrethroid when there is an average of one armyworm per two plants. Because adults lay eggs on grasses in and around rice fields, larval infestations can be reduced by effective management of weedy grasses.



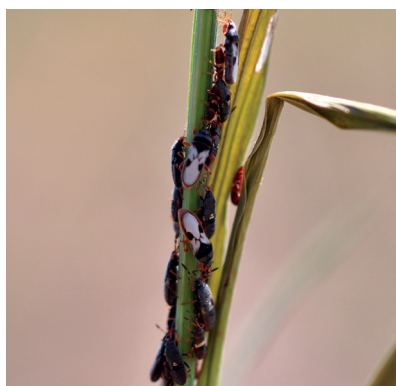
Fall armyworm larva

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.

CHINCH BUG

Chinch bugs are piercing-sucking insects that can damage young rice crops. Damage from chinch bugs appears as withering and yellowing of rice leaves, particularly at leaf tips, and resemble drought stress. Severe infestations can kill plants and reduce rice stand. Infestations are typically clumped and concentrated on field edges. Chinch bug infestations are most common in drill-seeded rice before the application of permanent flood. Chinch bugs feed on weedy grasses, and delayed herbicide application can cause infestations to move from weeds into rice fields. Pyrethroids are labeled for control of chinch bugs, but economic thresholds have not been established. Scout for chinch bugs prior to establishment of the permanent flood and consider treatment if high populations are observed killing rice plants. Flooding may reduce the need for insecticide applications and should be considered if the rice is mature enough to tolerate it.



Chinch bug adults (black and white) and nymphs (red and black) feeding on rice

BILL BUGS

Bill bugs are emerging as pests of furrow-irrigated row rice. Larvae are cream-colored grubs with reddish-brown head capsules, which reach a maximum size of approximately 1/2 inch. Larvae feed in the base of the plants where stems meet with the soil surface as well as in root masses. Powdery frass is present in stems and roots where feeding has occurred. Feeding causes the



Bill bug larva

appearance of a whitehead similar to those resulting from stem borers. Once whiteheads are present, controls are not likely to protect yields. Preliminary investigations suggest bill bugs can cause yield loss of more than 10% in row rice if unmanaged. Registered insecticidal seed treatments are not effective against this pest. Foliar application of Belay (clothianidin, 4 fluid ounces per acre) at approximately green ring stage can reduce whitehead incidence and protected yields. Scouting procedures and thresholds for this pest have not yet been established.

APPLE SNAILS

Although they are not insects, invasive apple snails are potential pests of seedling rice. The large snails have recently appeared in a small percentage of rice fields in southwestern Louisiana, but expansion into new regions is anticipated. Irrigation with surface water from snail-infested canals is thought to be the primary method of introduction into new fields. Impacts to drill-seeded rice have not been reported, but severe stand reduction can occur when water seeding into fields with heavy snail infestations.

Treatment of snail infestations with copper sulfate prior to water seeding can protect seedling rice. Applications must consider estimated water volume and calculate rates to obtain 10 parts per million copper sulfate.

Apple snails can be highly detrimental to crawfish production. Care should be taken to avoid introduction of the snails into rice/crawfish production systems through stocking ponds with infested crawfish sources or other means unintended introduction. **Copper sulfate cannot be used for control of snails in these systems because of the risk of harming crawfish.**



Apple snail

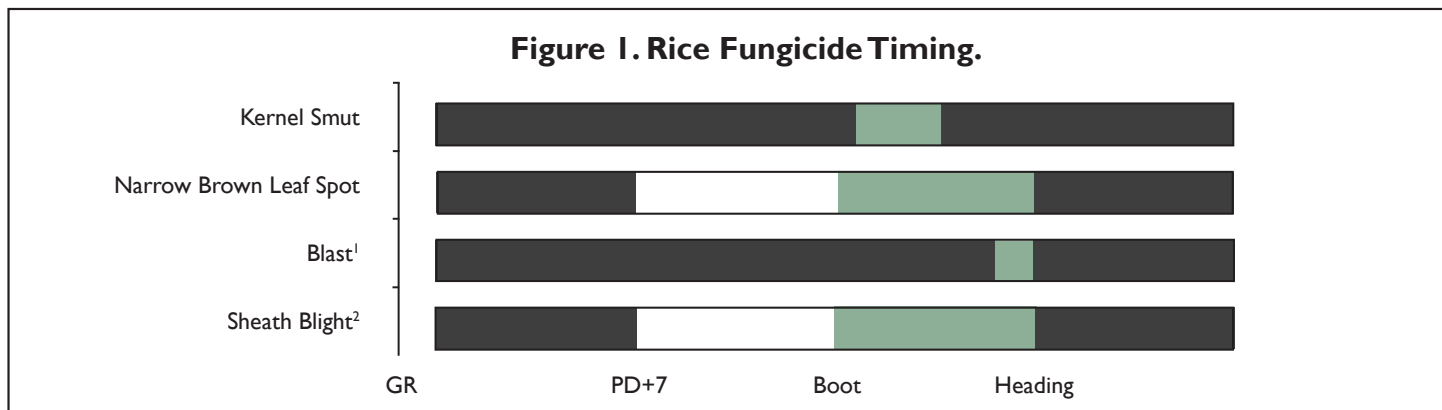


Apple snail eggs

RICE DISEASES

Best results in disease management are achieved when an integrated pest management (IPM) strategy is used. The combination of host resistance, cultural practices and reasonable use of fungicides offers better disease control than these methods applied isolated. Overall, varieties with some levels of disease resistance are available for most

of the relevant rice diseases, and their use is encouraged. Unbalanced mineral fertilization and late planting are frequently associated with severe disease epidemics for most diseases. Because the list of labeled fungicides may change, check with your cooperative extension agent for current recommendations. Fungicide timing is critical for disease control (Table 13 and Figure 1).



¹Susceptible varieties under high disease pressure may require an application at the boot stage followed by 50%-70% heading.

²An early application may be necessary if a sheath blight appears before the boot stage.

■ Not recommended □ Application may be needed ■ Best timing

Table 13. Efficacy of Fungicides in Managing Rice Diseases.

Efficacy categories: P = Poor; F = Fair; G = Good; VG = Very Good; NL = Not Labeled for use against this disease.

Class and Mode of Action Group ¹	Active Ingredient	Product(s) ²	Rate ³ (fl oz)	Blast	Sheath Blight	QoI Resistant Sheath Blight	Cercospora	Kernel Smut
QoI Strobilurins Group 11	Azoxystrobin	Quadris 2.08 SC Others	9-15.5	G	VG	P	P	P
	Trifloxystrobin	Flint Extra	3.1-4.7	VG	G	P	NL	NL
Carboxamides Group 7	Flutolanil	Elegia 3.8 F	12-32	NL	G	G	NL	NL
	Fluxapyroxad	Sercadis 2.47 SC						
Demethylation Inhibitors (DMI) Group 3	Propiconazole	Tilt 3.6 EC Others	6-10	NL	F	F	G	G
Mixed ⁴	Azoxystrobin, Propiconazole	Quilt Xcel 2.2 SE Others	14-27	G	VG	P	G	G
	Azoxystrobin, Difenconazole	Amistar Top Other	10-15	G	VG	G	G	G

¹Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

²Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied. Many products have specific use restrictions about the amount of active ingredient that can be applied within a period of time or the amount of sequential applications that can occur. Please read and follow all specific use restrictions prior to fungicide use. This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. Participants in the Rice Varieties and Management Tips publication assume no liability resulting from the use of these products.

³Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴Refer to product label for the fungicide class and mode of action group.

Bacterial Panicle Blight (BPB): Bacterial panicle blight, caused by the bacteria *Burkholderia glumae* and *B. gladioli*, is one of the most important rice diseases in the South. The disease is associated with warm temperatures (day and night) and moisture. Losses include reduced yields and poor milling. The bacteria are seed-borne, survive in the soil, and live on the surface of the leaves and leaf sheaths following the canopy up.



Bacterial panicle blight

The bacteria infect the grain at flowering and cause grain abortion and rotting during grain filling. The disease is first detected as a light- to medium-brown discoloration of the hulls' lower third to half shortly after emergence. The stem below the infected grain remains green. Pollination occurs, but the grain aborts sometime after grain filling begins. Rain splash can disperse the bacteria on the plant surface to other plants, developing a circular pattern in the field with the most severely affected panicles in the center remaining upright because of grains not filling.

No chemical control measures are recommended. Fungicide application will not control or prevent BPB. Some varieties have more resistance than others. Rice planted later in the season and fertilized with high nitrogen rates tends to have more disease.

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



Leaf blast



Node blast



Collar blast

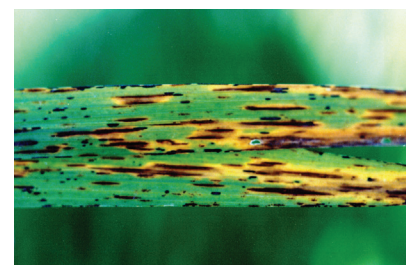


Rotten-neck blast

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.

Varieties with good resistance are available, although new races can develop fast and overcome genetic resistance. Scouting for blast should begin early in the season, and 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, fungicide 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 13 and Figure 1). If a single fungicide application is used to control blast, it should be applied when 50% to 70% of the heads have begun to emerge. Application before or after this growth stage will not control this disease well. 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 consider the chances of poor weather conditions. Under heavy blast pressure and conducive weather conditions, two applications, one at boot and one at 50% to 70% heading, may be needed to suppress blast effectively.

Cercospora: This disease is caused by the fungus *Cercospora janseana*, and symptoms can develop on the leaf, sheath, panicle, and grains. Similarly to blast, different names are used for this disease depending on the infected site. When symptoms occur in the leaf, the disease is referred to as **narrow brown leaf spot (NBLS)**, with linear and reddish-brown lesions along the leaf blade as the classic symptoms of NBLS. Some variation of the disease symptoms can be observed depending on the cultivar's resistance, with more susceptible varieties having wider, more numerous, and lighter brown with gray necrotic centers. Spots usually appear near or after heading growth stage, but both young and old leaves are susceptible. When symptoms develop on the sheath, the disease is called **Cercospora net-blotch (CNB)** due to the brown cell walls and the tan-to-yellow intracellular areas forming a netlike pattern. When infection occurs in the panicle, it can be referred to as **Cercospora panicle blight (CPB)**, where branches of the seed heads can become infected, causing premature ripening and unfilled grains.



Cercospora

Symptoms of CPB can be confused with blast rotten-neck and panicle blast lesions, but CPB symptoms usually are darker brown and develop in the internodal area of the neck. Glumes can also be infected, causing significant discoloration and necrosis, and grain infected appears as a diffused brown discoloration. The distinction between NBLS, CNB and CPB is important because some varieties can have some genetic resistance to NBLS, such as those with CRPS2.1 gene, but not CNB and CPB.

The disease's intensity is intermittent between years but is often severe on late planting fields and in the second crop. Warm, rain, and conditions that prolong leaf moisture favor the disease infection and development. However, it can take up to 30 days from the infection to the development of visible symptoms. The best fungicide timing for NBLS is between early boot to heading growth stages (Table 13 and Figure 1). However, the later the rice is planted, the earlier the fungicide must be applied. Triazoles fungicides, such as propiconazole and difenoconazole, provide the best efficacy.

False Smut: The false smut fungus, *Ustilaginoidea virens*, infects rice at flowering. The disease is characterized by large orange to olive-green spore masses that replace one or more grains on the panicle. 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. A fungicide seed treatment also reduces inoculum potential. False smut



False smut

spores cause discoloration of milled rice, but no significant yield loss is associated with the disease. The presence of the smut sclerotia in grain for export has caused problems. Some foliar fungicides applied at boot can reduce disease incidence. Research results indicate the 2- to 4-inch panicle in the boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly. Applications after boot split have little, if any, activity.

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 also causes discoloration of the kernel. Kernels discolored by fungal infections or insect damage are commonly called pecky rice. This complex disorder in rice 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.

Kernel Smut: Kernel smut symptoms appear just before maturity. A black mass of smut spores replaces all or some of the seed's endosperm. 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 the soil of affected fields and seeds. Significant yield reductions are possible, but usually, the damage is limited to grain quality. High nitrogen rates favor disease development. Research results indicate that boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly.



Kernel smut

Applications after boot split have little, if any, activity.

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 the leaf blades. Infections usually begin during the late tillering/joint-elongation stages of growth. The fungus, *Rhizoctonia solani* AG-1, survives between crops as structures called sclerotia or as hyphae in plant debris.

Sclerotia on 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.



Sheath blight

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, weakening them and causing tillers to lodge.

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. Disease severity can be reduced by integrating several management practices. Dense stands and excessive use of nitrogen fertilizer both tend to increase sheath blight damage. The same pathogen also causes aerial blight on soybeans. Therefore, rotation with soybeans or continuous rice increases the amount of inoculum in soils and should be avoided when possible. Fungicides are available for

Table 14. Rice Variety Reactions to Common Diseases in Louisiana.

"VS" = very susceptible, "S" = susceptible, "MS" = moderately susceptible, "MR" = moderately resistant, "R" = resistant, and "-" = unknown. Varieties labeled S or VS for a given disease may be severely damaged under conditions favoring disease or disorder development.

Variety	Blast	Sheath Blight	Narrow Brown Leaf Spot	Bacterial Panicle Blight	Straighthead
Addi Jo	R1	S	MR	MR	MR
Aroma22	S	MS	MR	MS	MS
Avant	S	S	MR	S	MR
Cheniere	MS	S	S	MS	MS
CL111	R ¹	VS	S	VS	MS
CL151	VS	S	S	VS	VS
CL153	R ¹	S	MS	MS	MS
CLJ01	MS	MS	MS	S	MS
CLL16	R ¹	S	MR	S	MR
CLL18	MS	MS	MR	-	MR
CLL19	R ¹	S	MS	S	S
CLM04	MS	MS	MR	MR	S
Della-2	MS	S	MS	MS	R
DG-263L	MR	S	R	MS	MR
Frontiere	-	S	S	-	S
Jazzman	MR	MS	S	S	MS
Jupiter	S	MS	S	MR	S
Mermentau	S	S	S	S	S
PVL03	R ¹	S	MS	MR	MR
PVL04	- ¹	S	MR	-	S
RT7301 ²	MR	MS	MR	MS	R
RT7302 ²	-	MR	MR	-	MR
RT7331MA ²	-	MR	MR	-	MR
RT7421FP ²	-	MR	MR	-	MR
RT7431MA ²	-	MR	MR	-	MR
RT7521 FP ²	MR	MS	MR	MR	R
RT781 ²	-	MR	MR	-	MR
Taurus	S	MS	MS	S	MS
Titan	S	S	MS	MS	S

¹Varieties with Pita-2 gene, known to confer resistance to most common blast races.

²Marker data not available for RiceTec products.

managing sheath blight. Avoid late application beyond 50% to 70% heading (Table 13 and Figure 1). In some areas of south Louisiana, the fungus has developed resistance to the strobilurin fungicides (e.g., azoxystrobin), and the use of other modes of action, such as carboxamides (e.g., flutolanil), is recommended where fungicide resistance was detected.

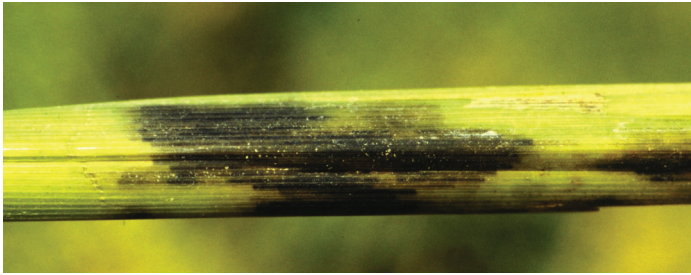
Sheath Rot: Sheath rot is caused by the fungus *Sarocladium oryzae*. Symptoms are most severe on the uppermost leaf sheaths that enclose the young panicle during the boot stage. Lesions are oblong or irregular oval spots with gray or light brown centers and a dark reddish-brown diffuse margin. Early or severe infections may affect the panicle so that it only partially emerges. The nonemerged portion of the panicle rots with florets turning

reddish-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 unfilled. Some varietal resistance is available. The disease is usually minor, affecting scattered tillers in a field and plants along levees. Occasionally,



Sheath rot

large areas may have significant damage. No control measures are currently recommended.



Stem 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 to 4 inches of soil and in plant debris. During early floods, sclerotia float to the surface, contact plants, 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 as the fungus penetrates the inner sheaths and the culm. These become discolored and have black or dark brown lesions. 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. Fungicide applications used against other fungal diseases may reduce stem rot damage.

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



Straighthead

flooding. Panicles are unfilled and upright at maturity or 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 confused with herbicide damage. Management is accomplished by using resistant varieties and draining the field approximately ten days before internode elongation (green ring), 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 ten days away. It is important that the flood be established again by internode elongation.

RICE DISEASE MANAGEMENT

The yield potential of any rice variety can be severely reduced under high disease levels. Management strategies with integrated pest management have a higher chance of successfully maintaining the disease below economic damage levels. It is important to have a comprehensive understanding of the field’s history and variety’s disease resistance package to plan the disease management strategy. Avoid scenarios that can increase the risk for multiple diseases. For example, late planting with a susceptible variety for sheath blight and blast in a field with historical problems for sheath blight may require multiple fungicide applications with uncertain control efficacy or investment return. For overall disease management, consider the following:

- The field’s disease history from pathogens that can survive in the soil (e.g., kernel smut). Also, consider crop rotation that can host rice pathogens, such as soybean aerial blight and rice sheath blight.
- Choose varieties with some level of genetic resistance.
- Avoid late planting as rice is more likely to encounter foliar disease problems.
- Maintain proper fertility levels.
- Maintain adequate irrigation flood, especially for varieties susceptible to blast.
- Use fungicides at the correct growth stage when necessary.
- Consider the yield potential, cost application, and overall disease intensity and risk for fungicide application.
- Rice cultivated for seed production purposes should have the minimum disease risk tolerance.
- If a ratoon crop is planned, disease not suppressed in the first crop may cause significant damage in the second crop.
- Plan to scout the fields frequently to assess the disease intensity, especially if the weather is conducive to disease development.

Rice disease control using a single fungicide application can be difficult because of fungicide resistance and multiple diseases requiring different timings for effective control. Rice producers are encouraged to use full labeled rates, rotate modes of action when possible, and use multiple fungicide applications when justified to effectively and economically manage rice diseases.

Fungicide timing is critical for disease control (Table 13 and Figure 1). Some growth stages are difficult to detect, and plant development may be uneven in the field, so scouting for disease and growth stages should be done frequently and throughout the entire field. Also, consider the logistics for fungicide application. Allow time to obtain a fungicide, schedule the application, and the chances for poor weather conditions that can prevent the application at the correct time.

WEED MANAGEMENT IN RICE

Management of weeds is critical for optimal 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.

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 15. The effectiveness of selected burndown herbicides on common winter vegetation is presented in Table 16. The activity of selective herbicide programs for perennial grass control is presented in Table 17. Information about rice herbicide use in crawfish production can be found in Table 18.

HERBICIDE OPTIONS FOR WEED CONTROL

2,4-D (Burndown and 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.

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 or Postscript (Postemergence) – Apply Beyond to Clearfield rice varieties and Clearfield hybrids. Apply Postscript to FullPage hybrids. Beyond/Postscript selectively controls red rice, annual grasses and broadleaf weeds. The application must be made after an application of Newpath/Preface or Clearpath. Beyond can be applied from four-leaf to panicle initiation (green ring) plus 14 days for Clearfield varieties, and Beyond/Postscript can be applied from four-leaf to panicle initiation (green ring) for Clearfield/ FullPage hybrids. Beyond/PostScript 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, 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 two- to three-leaf stage. For water-seeded rice, apply after rice is in the two-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.

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 five-leaf rice in dry-seeded rice and two- to five-leaf rice in water- seeded rice. Apply at a rate of 0.5 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 two- to four-leaf stages. Clincher has activity as a post-flood treatment on four-leaf to two-tiller grasses. Clincher works best under saturated soil conditions. Refer to label for approved tank mixes.

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 postemergence treatment to rice at the one- to two-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 one- to two-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.

Fall applications of Command have proved to be effective in controlling Italian ryegrass and rates are dependent on the soil type. A 24(c) special local need label has been issued for herbicide resistant Italian ryegrass management in fallow fields and states that Command can be applied between Oct. 1 and Nov. 30. See label for more instructions.

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 two-leaf stage. A 0.5 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.

Gambit (Burndown, preemergence and postemergence) – Gambit is a prepackage mixture of halosulfuron plus prosulfuron. Apply as a burndown with glyphosate or as a preemergence with a herbicide with residual activity on grasses. Gambit should be applied at a rate of 1 to 2 ounces per acre under dry or flooded conditions. Do not apply more than 2 ounces per acre per year. Refer to label for approved adjuvants. Gambit controls broadleaf weeds and sedges. Apply to actively growing weeds in the one- to three-leaf stage and three- to six-leaf stage for sedges. If applied under flooded conditions, weeds should be exposed above the flood 70% to 80%. Do not flush or flood within 48 to 72 hours after application. Hold flood water for 14 days after application, and do not apply within 48 days of harvest.

Grandstand (Postemergence) – Controls alligator weed, hemp sesbania, Texasweed, jointvetch and other

broadleaf weeds. It does not control duckweed. 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 two- to three-leaf to one-half-inch internode growth stages. In water-seeded production, apply to rice in the three- to four-leaf to half-inch internode growth stages. Do not apply more than 22 ounces per acre per year.

Highcard (Postemergence) – Apply only Highcard to Max-Ace varieties and hybrids. Highcard contains a safener to minimize the amount of injury to Max-Ace varieties and hybrids. In Max-Ace rice, non-safened quizalofop can result in high levels of crop injury and in some cases extensive crop loss. Highcard controls red rice, weedy rice, and annual grasses. Apply two applications of Highcard at 13 to 15.5 ounces per acre between the two- to three-leaf rice stage and panicle initiation. Do not apply more than 31 ounces per acre per year in Max-Ace rice.

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 to 6 ounces per acre when applied preemergence. Postemergence applications should be applied at 3 to 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, duckweed, 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.

Loyant (Postemergence) – Loyant can be applied to both drill- and water-seeded rice in the two-leaf stage at a rate of 1 pint per acre. A methylated seed oil (MSO) at 0.5 pint per acre is required. Wait at least 14 days between Loyant applications, and do not apply more than 2 pints per acre per year. Loyant controls most broadleaf and sedge

weeds found in rice, including many aquatic broadleaf weeds.

Loyant has no activity on Texasweed. Loyant has activity on small barnyardgrass, broadleaf signalgrass, junglerice and Amazon sprangletop no larger than three- to five-leaf. Apply to small, actively growing weeds. If the flood is not present at application, establish permanent flood within three days. If the permanent flood is present at application, make sure weeds are exposed 70% above flood level and wait three hours before adding additional water. Loyant has no residual activity on weeds that have yet to emerge. Avoid the use of Loyant on freshly cut or leveled ground, except water- leveled fields. Loyant has auxin activity similar to 2,4-D or Grandstand; therefore, caution should be taken to avoid drift to neighboring soybean and other broadleaf crops.

Newpath or Preface (Preemergence and postemergence) – Apply Newpath to Clearfield rice varieties and Clearfield hybrids. Apply Preface to FullPage hybrids. Newpath/Preface controls red rice, sedges and annual grasses. The first application to Clearfield rice should be Newpath or Clearpath for red rice control, and the first application of FullPage should be Preface. Each 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/Preface should be applied prior to flooding when rice is in the three- to five-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 two- to five-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 to 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.

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 ounce per acre, and the rate should not be reduced as is often done with Permit. The 0.75 ounce per acre rate provides 0.5 ounce per acre of Permit and

0.06 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.

Provisia (Postemergence) – Apply only to Provisia rice varieties. Provisia controls red rice, weedy rice and annual and perennial grass weeds commonly found in rice fields. Provisia can be applied in a two-application or three-application system. In the two-application system, the first application to Provisia rice should be applied at 13 to 15.5 ounces per acre. Adequate soil moisture is required for optimum herbicide activity. A second application of Provisia must be applied prior to panicle initiation. In the three-application system, Provisia can be applied at 10 ounces per acre three times between the one-leaf rice stage but no later than panicle initiation or two times between the one-leaf rice stage and panicle initiation and one application to the ratoon crop. In either system, do not apply more than 31 ounces per year. Applications of Provisia to Provisia rice can cause injury, and it is usually in the form of yellow foliage often referred to as a “yellow flash.” Caution should be taken to avoid spray overlap. When Provisia is mixed with other herbicides, antagonism can occur. Refer to Provisia label for approved mixtures.

Prowl (Delayed Preemergence) – Pendimethalin is sold under several different trade names, including Prowl. Prowl is used for the control of several grass species and some small-seeded broadleaf weeds. In drill-seeded rice, it can be used as a delay preemergence or early postemergence application in rice. Prior to application, the rice must imbibe water and begin germination to reduce stand loss or Prowl can be applied 4 to 9 days after planting to soil that has been sealed by a rain or flush. In water-seeded rice, Prowl cannot be sprayed prior to the 4-leaf rice growth stage or until the rice is well-rooted/pegged. The rice must be standing upright, and the water must be removed prior to application.

RebelEX (Postemergence) – A prepackaged mixture of Clincher plus Grasp. This product should be applied to small, actively growing weeds. Grasses should not exceed the three-leaf stage to avoid antagonism. The field should be wet for maximum Clincher activity, but weed vegetation should be 75% 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 three-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 HT has no activity on broadleaf weeds. Apply to small actively growing grasses in the two- to three-leaf stages. Ricestar HT works best under saturated soil conditions. The best option for Nealley's sprangletop control is 24 ounces per acre. Refer to label for approved tank mixes.

RiceOne (Delayed preemergence or early emergence) – RiceOne is a prepackage mixture of clomazone and pendimethalin. Because of the presence of pendimethalin in the mixture, this herbicide cannot be applied as a preemergence treatment immediately after planting. The mixture controls annual barnyardgrass, broadleaf signalgrass, sprangletop, fall panicum and small-seeded broadleaf weeds when applied prior to weed emergence. RiceOne may be applied as a surface broadcast application as a delayed preemergence application or as an early postemergence treatment to rice. Early postemergence applications will need another herbicide to control emerged weeds. RiceOne rates are soil-texture dependent; therefore, refer to the RiceOne label for proper rates. Do not apply to water-seeded rice.

Rindé (Postemergence) – Rindé is a liquid prepackaged mixture of quinclorac (Facet) and bispyribac-sodium (Regiment) for the control of barnyardgrass, other annual grasses and broadleaf weeds in rice. Rindé can be applied to drill-seeded and water-seeded rice from 3-leaf to green ring rice from 22 to 36 fluid ounces per acre. Rindé should be applied with an adjuvant and a nitrogen fertilizer source to achieve optimal weed control. See the Rindé Approved Surfactants bulletin for a list of approved surfactants and use rates.

Rogue (Postflood) – Rogue is labelled for use in both drill- and water-seeded rice and should only be applied

once a stable permanent flood has been established. In water-seeded rice, Rogue can be applied from pegging rice up until the rice reaches two tillers. In drill-seeded rice, Rogue can be applied between the four-leaf and two-tiller rice growth stage. Rogue can be surface-coated on fertilizer when the rice canopy will inhibit a liquid spray from reaching the water surface. Rogue controls sprangletop, rice flatsedge and duck salad and has activity on several other weed species. The use rate of Rogue ranges from 8.4 to 12.6 ounces per acre.

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 two- to three-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% wettable granule. Apply 2.08 to 2.5 ounces per acre prior to rice emergence through permanent flood. Do not apply after the half-inch internode stage.

Strada XT2 (Postemergence) – A prepackaged mixture of Strada plus quinclorac. The mixture provides both broadleaf and grass control. It is formulated as a 70% wettable granule. Apply 6 to 10 ounces per acre prior to or after rain or flushing. Rice seed exposed to spray may be severely injured.

Table 15. Effectiveness of Selected Preplant and Preemergence Rice Herbicides on Certain Weeds.

	Palmleaf Morningglory	Eclipta	Barnyardgrass	Red Rice	Sprangletop	Signalgrass	Fall Panicum	Sedge	Alligatorweed	Duckweed	Redstem	Hemp Sesbania	Waterhyssop	Jointvetch	Smartweed	Dayflower	Texasweed	Fimbristylis
Preplant Incorporated, Preplant, Preemergence or Delayed Preemergence ----- Weed-Control Ratings -----																		
Bolero PPS	4	0	8	8	8	7	6	5	4	7	3	0	6	4	5	7	5	8
Bolero PRE/DPRE	5	8	8	0	8	5	7	5	4	8	8	6	8	5	5	8	6	8
Clearpath	8	8	9	8	8	9	5	9	6	8	8	7	6	7	6	7	8	5
Command	0	0	9	0	8	8	9	0	0	7	0	0	0	0	2	7	0	0
Facet L	8	8	9	0	0	9	5	2	4	3	4	7	6	7	0	5	4	5
Gambit	4	7	0	0	0	0	0	9	8	8 ⁴	7	7	6	7	6	8	8	1
Newpath or Preface (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	5
Pendimethalin + Facet (DPRE)	8	8	9	0	9	8	5	6 ¹	6	3	2	8	4	7	0	3	6	7
RiceOne	0	0	9	0	8	9	9	0	0	7	0	0	0	5	2	7	0	7
Sharpen	8	7	4	0	4	4	6	6	4	4	6	7	6	7	6	7	7	6
Effectiveness of Selected Postemergence Rice Herbicides on Certain Weeds																		
2,4-D	9	9	0	0	0	0	0	2 ³	8	9	9	9	9	7	6	8	9	9
Aim4	8	6	0	0	0	0	0	5	5	4	6	9	7	6	8	5	6	5
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	7 ³
Beyond or Postscript	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	0
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	-
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	0
Facet L	8	9	9	0	0	9	5 ²	4	6	3	3	8	3	8	0	3	6	0
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	4 ³
Gambit	9	9	0	0	0	0	0	9	8	9 ⁴	9	9	7	9	9	8	8	0
Grandstand	9	8	0	0	0	0	0	5	7	3	9	7	8	8	7	6	9	8
Grasp	3	7	9	0	3	3	3	8	7	8	8	9	7	7	8	7	6	2
Grasp Xtra	9	8	9	0	3	3	3	8	7	8	9	9	8	8	8	7	9	7
League	8	8	0	0	0	0	0	8	6	7	8	9	-	8	-	8	8	0
Londax	5	8	0	0	0	0	0	8	7	9	9	6	9	6	6	8	8	0
Loyant	9	9	6 ⁴	0	6 ⁴	6 ⁴	6 ⁴	8	9	9	8	9	8	9	9	8	4	0
Newpath or Preface	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	0
Permit/Halomax	7 ⁴	8	0	0	0	0	0	9	4	5	8	9	4	9	4	8	7 ⁴	0
Permit/Halomax + Londax	7 ⁴	8	0	0	0	0	0	9	7	9	9	9	9	9	6	8	8	0
Permit Plus	7 ⁴	9	0	0	0	0	0	9	6	7	9	9	6	9	8	8	7 ⁴	0
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	4 ³
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	4 ³
Propanil + Permit/Halomax	9	9	9	0	7 ²	9	8 ²	9	5	5	8	9	9	9	5	8	8 ⁴	4 ³
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	4 ³
Provisia	0	0	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0
RebelEX	3	7	9 ²	0	9 ²	9 ²	8 ²	8	7	8	8	9	7	7	8	7	6	0
Regiment	8	6	9	0	3	3	0	7 ³	7	8 ²	8	8	7	8	7	7	8	7
Ricestar HT	0	0	9 ⁴	0	8	9	7 ²	0	0	0	0	0	0	0	0	0	0	0
Rogue2	-	-	5 ⁴	0 ⁵	9	-	-	9 ⁶	3	9	0	3	7	2	-	4	5	8
Sharpen	8	8	0	0	6 ²	5 ²	6 ²	6 ³	7	8	9	8	-	9	7	7	8 ⁴	4 ³
Strada	7	8	0	0	0	0	0	8	5	7	9	9	8	9	6	9	6	0
Strada PRO	7	8	0	0	0	0	0	9	5	7	9	9	8	9	6	9	6	0
Strada XT2	8	9	9	0	0	9	5 ²	8	6	7	8	9	8	9	6	9	4	0

¹ Annual sedge suppression. ² With proper water management. ³ Weeds must be <4 inches tall. ⁴ Controlled only when small (< 2 leaf). ⁵ Possible weedy rice suppression. ⁶ Annual sedge control only.

Table 16. Effectiveness of Selected Burndown Herbicides.

		Annual Ryegrass	Annual Bluegrass	Carolina Foxtail	Little Barley	Henbit	Cutleaf Evening Primrose	Chickweed	Geranium spp.	Curly Dock	Buttercup spp.	Mare's Tail	Smartweed	Swinecress	Shepherd's Purse	Bittercress
Preplant Burndown	Rice Plant Back (Days)	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
Gambit + Glyphosate	0	7	9	9	9	9	8	9	8	9	9	9	9	8	9	9
Glyphosate	0	7	9	9	9	6	5	9	5	6	9	9	7	7	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
Leadoff	10 Months	8	9	–	–	9	9	9	–	–	9	9	9	–	–	–
Sharpen + Glyphosate	0	7	9	9	9	9	8	9	7	9	9	9	9	9	9	9
Valor + Glyphosate	30	7	9	9	9	9	8	9	6	8	9	9	9	8	9	9

Table 17. Activity of Selective Herbicide Programs for Perennial Grass Control¹.

Herbicide Program	Brook Paspalum	Knotgrass	Creeping Rivergrass ³	Water Paspalum	Nealley's Sprangletop
Clincher fb Clincher ¹	7	9	8	9	6
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
Loyant	4	6	6	5	6
Newpath fb Beyond ¹	7	9	8	8	6
Newpath fb Newpath ¹	7	9	8	8	6
Propanil ¹	2	3	3	2	5
Provisia fb Provisia	5	9	7	9	9
Regiment fb Regiment ¹	3	2	7	2	4
Ricestar HT fb Ricestar HT ¹	3	4	6	5	8

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 18. 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/Postscript	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.
Gambit	Do not commercially grow fish, shellfish or crustaceans on treated acres during the year of treatment.
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.
Loyant	Except for crawfish, do not fish or commercially grow fish, shellfish or crustaceans on treated acres during the year of Loyant treatment.
Newpath/Preface	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.
Provisia	Crawfish not specifically mentioned; however, do not allow Provisia rice go to seed in a nonrice year. This includes any fallow or crawfish production fields.
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 for 12 months following treatment. Do not use adjacent to catfish/crawfish ponds.
RiceOne	Do not apply on rice fields in which concurrent crawfish farming is included in the cultural practices.
Ricestar HT	Ricestar must not be applied to fields where crawfish are cultured commercially.
Rogue	Do not fish or commercially grow fish, shellfish or crustaceans on treated acres during the year of treatment.
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.

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