

# CLEARFIELD® Rice

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## Introduction

CLEARFIELD® rice was intentionally created from a mutation that confers tolerance to imidiazolinone herbicides. Since CLEARFIELD® is not a GMO (maintains pure DNA from rice), it has been accepted in the world rice market. This technology has allowed for preemergence and postemergence applications of imazethapyr (Newpath®) and postemergence applications of imazamox (Beyond®) to control red rice. Before the advent of this technology, there were no effective options to control red rice in conventional white rice.

Since the commercial introduction of CLEARFIELD® rice in 2002, this technology has been widely adopted. In 2006, CLEARFIELD® rice was grown on 33 percent of the rice acreage in Mississippi. The increase in CLEARFIELD® rice acres has resulted from the release of higher yielding varieties, exceptional red rice control, and an overall simpler weed control program. Current CLEARFIELD® rice varieties typically yield 5–10 percent less than the predominate Mississippi rice variety, Cocodrie. Once CLEARFIELD® rice varieties are released that meet or exceed rice yields of high yielding non-CLEARFIELD® varieties, CLEARFIELD® rice acres are expected to increase.

## Clearfield Rice Varieties

CLEARFIELD® rice varieties are currently being developed by Louisiana State University, the University of Arkansas, and Mississippi State University in cooperation with BASF, and these varieties are sold and marketed through Horizon Ag's ORYGEN™ Seed Marketing System. All CLEARFIELD® varieties are protected under the PVP act and BASF's stewardship agreements.

Currently, CL 161 and CL 171-AR are the only widely available CLEARFIELD®

varieties. CL 131 and CL 151 will be available in small quantities in 2008 and are expected to be commercially launched in 2009. CL 131, CL 151, CL 161, and CL 171-AR all are enhanced tolerant varieties that can withstand two labeled postemergence applications.

CL 131 is a long-grain, semi-dwarf variety released by Horizon Ag in 2004. Preliminary data (from 2005 and 2006) indicates an approximate yield advantage of 6 bu/A over CL 161. CL 131 has excellent milling qualities and matures about 4 days earlier than CL 161. This variety is very susceptible to sheath blight but has a lower potential to lodge than CL 161.

CL 151 is a long-grain, semi-dwarf variety released by Horizon Ag in 2008. Preliminary data indicates CL 151 yields comparable to or better than CL 131. CL 151 has good milling qualities and matures about 1 day earlier than CL 161. This variety is very susceptible to sheath blight.

CL 161 is a long-grain, semi-dwarf variety released by Horizon Ag in 2001. CL 161 has excellent milling qualities. CL 161 reaches heading about 1 day later than Cocodrie and matures about 3 days later than Cocodrie. This variety is very susceptible to sheath blight and has a greater potential to lodge than CL 131.

CL 171-AR is a long-grain, semi-dwarf variety released by Horizon Ag in 2007. Preliminary data indicates that CL 171-AR has comparable yield potential to CL 161. CL 171-AR has very good milling qualities and matures about 1 day later than CL 161. This variety is very susceptible to sheath blight.

See **Table 1** for the disease reaction of these varieties compared to other common varieties and **Table 2** for the nitrogen fertilization recommendations for these varieties.

## Weed Control in CLEARFIELD® Rice

Newpath® (imazethapyr) is registered for use in CLEARFIELD® rice and can provide both foliar and residual soil activity. For the current available CLEARFIELD® enhanced tolerant varieties, two applications of Newpath® can be made postemergence at a rate of 4 to 6 fl oz/A/application. The first Newpath® application should be made at the early postemergence timing (one- to two-leaf rice) followed by another postemergence application at the late postemergence timing (three- to five-leaf rice). Another option is to apply Newpath® preemergence or pre-plant incorporate (PPI) at 4 to 6 fl oz/A and make another application at the three- to five-leaf rice stage. However, this is not the preferred method due to the longer time between applications and/or flooding, which could lead to red rice escapes. Refer to **Table 3** for Newpath® use rates and timings. Also, please read and follow Newpath® label instructions.

In a CLEARFIELD® weed control system, red rice control is the primary objective. However, Newpath® does provide control of other common grass and sedge weeds, such as barnyardgrass, broadleaf signalgrass, and yellow nutsedge. Amazon sprangletop, hemp sesbania (coffeebean), and northern jointvetch are some weaknesses in the CLEARFIELD® system. For effective Amazon sprangletop control, it is recommended that Command® be applied preemergence or pendimethalin (Prowl® or Pendimax®) be applied delayed-preemergence (see appropriate label for use rates). For effective hemp sesbania and/or northern jointvetch control, products such as propanil, Aim®, Facet®, or Grandstand® can be effective (see appropriate label for use rates). See Extension Publication 1532 Mississippi Weed Control Guidelines for more specific control recommendations.

Clearpath™ also can be used in conjunction with the CLEARFIELD® system. Clearpath™ applied at 0.5 lb/A is equivalent to 4 fl oz/A of Newpath® and 0.4 lb/A of Facet® (quinclorac). Clearpath™ can provide additional control of barnyardgrass, hemp sesbania, northern jointvetch, and morningglories. Clearpath™ can be applied only once during the growing season and will substitute for one Newpath® application. Refer to **Table 3** for Clearpath™ use rates and timings. Also, please read and follow Clearpath™ label instructions.

Beyond® is labeled for use in CLEARFIELD® rice. Beyond® is used primarily to control red rice plants that survived from the previous Newpath® applications. Beyond® can be applied only after two applications of Newpath®, and it cannot be applied past panicle initiation plus 14 days (about 2 weeks after mid-season). The application rate of Beyond® is 5 fl oz/A. See Beyond® label for full details.

## CLEARFIELD® Rice Stewardship

To protect the long-term viability of CLEARFIELD®, please conform to a good stewardship program. The following are recommendations for proper stewardship:

- Purchase certified CLEARFIELD® rice seed to produce a single commercial crop.
- Avoid continuous use of CLEARFIELD® rice. Continually rotate with other crops, such as soybeans.
- Plant CLEARFIELD® rice early to avoid synchronized pollination of CLEARFIELD® rice and red rice to reduce outcrossing potential.
- Maintain good soil moisture during and following Newpath® applications. Flush if adequate rainfall (> 0.5 inch) is not received within 2 days of a Newpath® application.
- Use an adequate spray volume (> 10 GPA) in all Newpath®, Clearpath™, and Beyond® applications to ensure good spray coverage.
- Use Beyond® and/or roging to clean up any red rice escapes following two applications of Newpath®.
- Use alternative mode of action herbicides in rotational crops.

## CLEARFIELD® Rotational Guidelines

Mississippi State University does not recommend or endorse growing CLEARFIELD® rice in successive crops. Also, conventional rice varieties cannot be grown following CLEARFIELD® rice due to potential injury from carryover of the Newpath® herbicide. See **Table 4** and appropriate label for crop rotation restrictions.

## Other Pest Management Issues in CLEARFIELD® Rice

CL 131, CL 151, CL 161, and CL 171-AR are rated very susceptible to sheath blight. Therefore, fields will need to be closely monitored for sheath blight infection from midseason (green ring) through the boot stage. A fungicide application should be considered when sheath blight incidence reaches 35 percent, and a higher-labeled fungicide rate may be necessary to achieve adequate control.

CL 131, CL 151, and CL 161 are rated susceptible to kernel smut. A preventive application of a fungicide containing the active ingredient propiconazole at the mid- to late-boot timing may be necessary to prevent yield and quality losses associated with kernel smut.

CL 131 and CL 151 are rated very susceptible to straighthead. As a result, when growing CL 131 or CL 151 on sandy to silt loam soils and/or fields that have historic problems with straighthead, it is recommended that they be drained for straighthead, or choose a more straighthead-resistant variety, such as CL 161 or CL 171-AR.

**Table 1. Rice variety reactions to diseases<sup>a</sup>.**

Variety	Sheath Blight	Blast	Kernel Smut	False Smut	Straighthead	Lodging
CL 131	VS	S	S	MS	VS	MR
CL 151	VS	VS	S	-	VS	MS
CL 161	VS	S	S	S	MS	S
CL 171-AR	VS	MS	S	S	MS	MS
Cocodrie	S	MS	VS	S	VS	MR
Wells	MS	S	MS	S	MS	MS

<sup>a</sup>Abbreviations: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible, VS=very susceptible

**Table 2. Recommended N rates for CLEARFIELD® varieties grown in Mississippi.**

Variety	Clay Soils		Silt Loam Soils	
	PF	MS	PF	MS
	(lb N/A)			
CL 131	120-150	30-60	120	46
CL 151	120-150	30-60	120	46
CL 161	90-120	30-60	90	60
CL 171-AR	120-150	30-60	120	46

PF = pre flood, MS = midseason

**Table 3. Newpath® and Clearpath™ use rates and timings for enhanced tolerant CLEARFIELD® varieties.**

	PPI/PRE	Early Post (one- to two-leaf rice)	Mid Post (two- to three-leaf rice)	Preflood (three- to five-leaf rice)
PRE/PPI Options	(1) Newpath® @ 4-6 fl oz/A		Newpath® @ 4-6 fl oz/A	
	(2) Newpath® @ 4-6 fl oz/A		Clearpath™ @ 0.5 lb/A	
	(3) Clearpath™ @ 0.5 lb/A		Newpath® @ 4-6 fl oz/A	
Total POST Options	(4)	Newpath® @ 4-6 fl oz/A		Newpath® @ 4-6 fl oz/A
	(5)	Newpath® @ 4-6 fl oz/A		Clearpath™ @ 0.5 lb/A
	(6)	Clearpath™ @ 0.5 lb/A		Newpath® @ 4-6 fl oz/A

**Table 4. Rotational guidelines following Newpath® and Clearpath™.**

Crop	Newpath® Total Rate <sup>1</sup>		Clearpath™ Plus Newpath® <sup>2</sup>	
	8 fl oz/A	8–12 fl oz/A	0.5 lb/A + 4 fl oz/A	0.5 lb/A + 6 fl oz/A
Cotton	18 months	18 months	18 months	18 months
Field corn	8.5 months	18 months	10 months	18 months
Oats	18 months	18 months	18 months	18 months
Rice (non-Clearfield)	18 months	18 months	18 months	18 months
Rye	4 months	18 months	10 months	18 months
Sorghum	18 months	18 months	18 months	18 months
Soybean	anytime	anytime	10 months	10 months
Sweet corn	18 months	18 months	18 months	18 months
Wheat	4 months	18 months	10 months	18 months
Other crops <sup>3</sup>	18 months	18 months	18 months	18 months

<sup>1</sup>Total of two sequential applications of Newpath®.

<sup>2</sup>Using Clearpath as a substitute for one Newpath® application.

<sup>3</sup>See product label for other crops.

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