

WEED RESPONSE RATINGS FOR RICE HERBICIDES

(See Explanation for Ratings Tables on Page 3.)

HERBICIDES	WSSA GROUP #	GRASSES							BROADLEAF WEEDS													SEDGES						
		Barnyardgrass ¹	Broadleaf Signalgrass	Crabgrass	Fall Panicum	Weedy rice	Rice Cutgrass	Sprangletop spp.	Ammania (red stem)	Dayflower	Ducksalad	Eclipta	Gooseweed	Groundcherry	Hemp Sesbania (coffeebean)	Indian Jointvetch	Northern Jointvetch (curly indigo)	Palmleaf Morningglory	Pigweed, Palmer ²	Pitted Morningglory	Smartweed	Texasweed	Water Hyssop	Flatsedges ³	White-margined flatsedge	Spikerush	Umbrella Sedge	Yellow Nutsedge
Preemergence																												
League	2	0	0	0	0	0	0	0	7	-	5	-	-	-	9	8	8	2	0	2	7	8	-	8	5	-	0	8
Prowl delayed PRE	3	8	6	8	7	0	0	6	0	0	4	0	0	-	0	0	0	0	6	0	0	0	0	0	0	0	0	0
Facet	4	9	9	9	9	0	0	0	3	5	3	8	3	8	6	7	7	7	4	7	0	0	6	5	6	-	0	0
Facet + Prowl delayed PRE	4/29, 3	9	9	9	9	0	0	7	3	5	3	8	3	-	7	7	7	8	6	8	0	0	6	5	6	-	0	0
Facet + Bolero delayed PRE	4/29, 15	9	9	9	9	0	0	8	6	7	7	9	5	-	8	8	8	8	5	8	5	-	6	8	8	7	4	0
Quinclorac + clomazone	4/29, 13	10	10	10	10	0	0	9	3	6	3	8	4	8	7	8	8	8	4	8	6	0	6	5	6	7	-	0
Gambit	2	2	0	0	0	0	0	0	-	7	-	7	-	8	7	7	7	5	0	5	8	-	-	8	5	-	-	8
Clomazone	13	9	9	9	9	0	0	9	0	3	3	3	0	-	2	3	3	4	0	3	2	0	0	0	0	0	0	0
Sharpen	14	0	0	0	0	0	0	0	-	-	-	-	-	-	4	4	4	7	9	7	4	-	-	8	7	-	8	2
Bolero delayed PRE	15	7	5	7	7	0	0	7	7	8	7	8	6	-	5	5	5	5	-	5	5	-	7	7	8	7	4	4
Bolero – Water seeded	15	8	7	7	-	8*	0	8	3	6	6	-	6	-	-	-	-	-	-	-	-	-	5	7	8	5	3	3
Prowl + Bolero delayed PRE	3, 15	9	7	8	8	3	0	8	7	7	7	8	6	-	5	5	5	5	6	5	5	-	7	7	8	7	4	4
Early Postemergence																												
Clincher	1	8	9	5	9	0	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Provisia fb Provisia fb Provisia	1	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Highcard fb Highcard	1	9	9	10	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ricestar HT	1	9	9	8	7	0	2	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grasp	2	8	0	0	0	0	6	0	7	8	9	8	-	8	8	8	8	4	0	5	7	7	8	8	5	8	0	6
Newpath/Preface fb Newpath/Preface-Beyond Xtra/Postscript	2	9	9	9	9	9 ⁴	9	8	8	5	7	0	5	9	0	0	0	5	0	7	9	5	0	9	5	9	0	8
Permit	2	0	0	0	0	0	0	0	5	8	3	5	4	6	9	3	6	0	0	4	4	5	-	9	5	-	0	9
Permit Plus	2	0	0	0	0	0	0	0	8	9	7	7	4	8	9	5	7	3	0	5	7	5	-	9	5	-	0	9
Regiment	2	8	0	0	0	0	7	3	6	9	9	7	0	-	8	7	7	4	0	5	9	7	6	4	3	-	3	5
Facet	4	8	9	7	6	0	2	0	3	3	3	9	3	8	8	8	8	8	4	8	0	0	3	5	6	-	0	0
Grandstand + Permit	4, 2	0	0	0	0	0	0	0	8	8	4	5	-	4	8	9	9	9	4	9	7	9	-	9	5	-	3	9
Facet + propanil	4, 5	9	9	7	9	0	2	4	6	5	6	9	5	8	9	9	9	8	8	8	6	6	8	9	6	9	3	5
Grandstand + propanil	4, 5	9	9	7	9	0	0	4	9	5	8	9	8	4	9	9	9	9	9	9	7	8	8	9	5	9	3	5
Propanil (weeds less than 2")	5	9	9	7	9	0	1	4	6	5	7	8	5	-	9	9	9	4	8	4	6	6	8	9	5	9	5	4
Propanil fb propanil	5	9	9	7	9	0	2	8	6	6	7	9	5	-	9	9	9	5	10	5	8	6	8	10	7	9	6	6
Propanil + Permit	5, 2	9	9	7	9	0	1	4	6	9	7	8	5	6	10	9	9	4	7	4	6	5	8	9	5	9	3	9
Propanil + Prowl	5, 3	9	9	7	9	0	1	9	7	5	7	9	6	-	9**	9**	9**	5	8	5	6	4	7	9	5	7	3	5
Propanil + Bolero	5, 15	9	9	7	9	0	2	9	8	8	8	9	6	-	9**	9**	9**	5	8	5	6	4	9	9	5	9	8	5

¹Some biotypes of barnyardgrass in Arkansas are resistant to Command, propanil, Facet or both (Facet + propanil), Newpath, Grasp, Regiment, Clincher, Ricestar, and Loyant.

²Best barnyardgrass control is achieved through a program approach with overlapped residuals at the front of the season.

³Data from Arkansas resistance screenings has identified WSSA Group 3 (pendimethalin) and Group 14 (saflufenacil) resistant pigweed.

⁴Expect reduced control from herbicides such as Prowl or Sharpen when used alone.

⁵Data from Arkansas resistance screenings indicates more than 50% of annual flatsedge populations test positive

for ALS-inhibitor (Permit) resistance.

⁶Off-types and evolved herbicide resistance would reduce this rating significantly (near 0).

*Water seed pin-point flood culture.

**Postemergence control only.

Rating Scale – 0 = No Control 10 = 100% Control.

WEED RESPONSE RATINGS FOR RICE HERBICIDES (cont.)
(See Explanation for Ratings Tables on Page 3.)

HERBICIDES	WSSA GROUP #	GRASSES							BROADLEAF WEEDS														SEDGES					
		Barnyardgrass ¹	Broadleaf Signalgrass	Crabgrass	Fall Panicum	Weedy rice	Rice Cutgrass	Sprangletop spp.	Ammania (red stem)	Dayflower	Ducksalad	Eclipta	Gooseweed	Groundcherry	Hemp Sesbania (coffeebean)	Indian Jointvetch	Northern Jointvetch (curly indigo)	Palmleaf Morningglory	Pigweed, Palmer ²	Pitted Morningglory	Smartweed	Texasweed	Water Hyssop	Flatsedges ³	White-margined flatsedge	Spikerush	Umbrella Sedge	Yellow Nutsedge
Early Postemergence [cont.]																												
Basagran	6	0	0	0	0	0	0	0	8	9	6	8	7	0	3	3	3	8	0	3	7	0	8	8	6	8	7	6
Basagran + propanil	6, 5	9	9	7	9	0	2	5	9	9	7	9	7	4	9	9	9	8	7	5	8	6	9	9	7	9	8	7
Aim	14	0	0	0	0	0	0	0	6	7	5	7	-	8	9	6	6	10	6	10	9	3	7	-	0	0	3	0
Sharpen	14	0	0	0	0	0	0	0	8	7	5	9	7	8	9	9	9	9	7	10	-	8	8	8	4	-	6	6
Ultra Blazer + propanil	14, 5	8	8	7	8	0	1	5	6	5	7	8	5	8	9	6	9	8	9	8	7	3	8	8	5	8	2	5
Early Postflood ⁵																												
Ricestar + Regiment	1, 2	8	5	5	4	0	4	6	4	6	6	5	0	-	6	5	5	2	0	3	7	5	4	1	1	-	1	2
Ricestar + Beyond Xtra	1, 2	8	8	8	8	6 ⁴	6	8	6	2	4	0	3	6	0	0	0	2	0	4	6	4	0	6	3	6	0	5
Novixid ⁶	2, 4	7	5	0	0	0	3	4	6	8	9	8	8	5	9	9	9	2	8	6	4	4	8	8	3	7	8	6
Rogue	27	5	3	-	-	8***	8	9	0	-	10	-	6	-	6	6	6	-	-	-	3	-	-	10	7	-	10	6
Midseason																												
2,4-D	4	0	0	0	0	0	0	0	9	9	9	9	6	5	9	5	5	9	8	9	6	0	9	8	7	8	3	5
Grandstand + propanil	4, 5	4	4	4	4	0	0	0	9	-	6	6	7	3	9	8	9	9	7	9	5	0	8	5	5	8	5	3
Propanil	5	4	4	4	4	0	0	0	4	0	3	4	0	4	8	5	5	3	6	0	3	0	8	5	5	7	5	3
Propanil + Ultra Blazer	5, 14	5	5	5	5	0	0	0	5	2	4	5	2	5	9	6	6	7	7	8	7	0	8	6	5	7	5	4
Ultra Blazer	14	0	0	0	0	0	0	0	0	0	0	0	0	3	9	0	0	3	6	3	6	0	0	0	0	0	0	0

*Water seed pin-point flood culture. **Postemergence control only. ***Only effective on sensitive populations.
There are known Rogue-resistant weedy rice populations within Arkansas. Rating Scale: 0 = No Control 10 = 100% Control.

ROW RICE WEED RESPONSE RATINGS TABLE

HERBICIDES	Goosegrass	Large Crabgrass	Johnson-grass	Carpetweed	Entireleaf Morning-glory ²	Prickly Sida ³	Palmer Amaranth ⁴	Sicklepod
Preemergence								
Prowl	C	C	C ¹	C	NR	C	C	NR
Bolero	C	S	-	-	-	-	-	-
Clomazone	S	C	S ¹	NR	NR	S	NR	NR
Sharpen	NR	NR	NR	C	C	C	C	NR
Early Postemergence								
Clincher	S	S	C	NR	NR	NR	NR	NR
Ricestar	S	C	C ¹	NR	NR	NR	NR	NR
Grasp	NR	NR	NR	NR	S	NR	NR	C
Newpath/Preface - Beyond Xtra/Postscript	S	S	C ¹	C	S	S	NR	NR
Gambit	NR	NR	NR	NR	S	C	NR	C
Regiment	NR	NR	C	NR	C	NR	NR	C
Loyant	NR	NR	NR	-	NR	NR	C	C
Facet	NR	C	NR	-	C	NR	NR	NR
Grandstand	NR	NR	NR	-	C	NR	NR	C
Propanil	C	C	S	C	C	S	S	S
Ultra Blazer	NR	NR	NR	C	C	NR	S	NR

C = Control S = Suppression NR = Not Recommended
¹Johnsongrass seedling only, not rhizome.

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¹Some biotypes of barnyardgrass in Arkansas are resistant to Command, propanil, Facet or both (Facet + propanil), Newpath, Grasp, Regiment, Clincher, Ricestar, and Loyant. **Best barnyardgrass control is achieved through a program approach with overlapped residuals at the front of the season.**
²Data from Arkansas resistance screenings has identified WSSA Group 3 (pendimethalin) and Group 14 (saflufenacil) resistant pigweed. Expect reduced control from herbicides such as Prowl or Sharpen when used alone.
³Data from Arkansas resistance screenings indicates more than 50% of annual flatsedge populations test positive for ALS-inhibitor (Permit) resistance.
⁴Off-types and evolved herbicide resistance would reduce this rating significantly (near 0).
⁵Applying these herbicides individually, rather than in a mixture, would result in significantly reduced control at this timing.
⁶These ratings are based on spray applications. Reduced grass control would be observed if coated on fertilizer.

RAINFALL-FREE PERIODS FOR POSTEMERGENCE RICE

Herbicide	Time Before Rainfall	Herbicide	Time Before Rainfall
2,4-D	6 hrs	Newpath/Preface	1 hr
Aim	1 hr	Permit/Permit Plus	4 hrs
Basagran	4 hrs	Propanil	6 hrs
Beyond Xtra/Postscript	1 hr	Provisia/Highcard	1 hr
Bolero	24 hrs	Regiment	8 hrs
Clincher	1 hr	Ricestar HT	1 hr
Facet	6 hrs	Sharpen	1 hr
Gambit	4 hrs	Storm	8 hrs
Grasp	1 hr	Strada	6 hrs
League	6 hrs	Ultra Blazer	4 hrs
Loyant	2 hrs		

Crop Replant and Rotation Guide for Rice Herbicides

Herbicide	Replant/Crop Rotation	Time Interval	Precautions
2,4-D	All	90 days	90 days or until sufficiently dissipated.
Aim	AL, CL All other	12 months I	
Basagran	All	I	
Beyond Xtra/ Postscript	S A B, CT, GS, O, SF, P, C, R CA	I 3 months 9 months 18 months	
Bolero	All*		* Do not plant subsequent crops in treated fields within 6 months of last application. Do not use in fields where fall farming of crayfish will be practiced. Do not apply to second stubble rice crop.
Clincher	All	3 months	No more than 25 oz per growing season. Keep away from peach trees.
Clomazone	S W	I 4 months	
Facet	GS, R, W All	I 10 months	Do not plant tomatoes or carrots within 2 years. Do not use in fields for fish farming or where fall farming of crayfish will be practiced.
Gambit	R C W, GS, SG CT, P, S	I 1 month 2 months 10 months	See label for other rotational crop restrictions.
Grandstand	R All	I 4 months	
Grasp	All	3 months	
League	R CT C, S, GS	I 8 months 12 months	* See label for vegetables and other crops.
Londax	All	120 days	
Loyant	All	3 months	
Newpath/ Preface	S, P, Clearfield Corn, Clearfield Rice W C CT, GS, Non-Clearfield Rice	I 4 months 8.5 months 18 months	Wheat rotation is longer if more than 8 oz/year is used.
Novixid	All	3 months	

Herbicide	Replant/Crop Rotation	Time Interval	Precautions
Permit, Permit Plus or Halomax	R W, C, GS CT, P S SF	I 2 months 6 months 9 months 18 months	Preplant to rice up to pH 8.
Propanil	All	I	
Provisia	B, CA, CT, S, SF, W All	I 120 days	Provisia rice can be planted immediately. Do not plant Provisia rice in consecutive years.
Prowl	CT, S All B, W	I FY 120 days*	* 90 days after a post incorporated application in irrigated field corn or grain sorghum. Do not plant following irrigation if crop failure occurs. Do not plant following no-till practices. Do not plant following higher Prowl rates for rhizome johnsongrass or weedy rice.
Regiment	R All	I FY	
Ricestar HT	R, S All	I 9 months FY	
Rinde	GS, R, W All AL, CL	I 10 months 24 months	
Rogue	All	30 days	
Sharpen	C, R, GS, SG, S CT All	I 1.5 months 4 months	Sweet corn plant back is 0.5 months.
Storm	All	Fall	
Strada	R C, SG C, S All others	I 3 months 6 months 12 months	
Ultra Blazer	P, S All*	I FY	* Root crops (such as carrots, turnips, sweet potatoes, etc.) must not be planted in treated fields for a period of 18 months following treatment.

* This table applies to the major field and forage crops. Refer to the herbicide labels for the latest recrop and rotation information for horticultural crops. These are written as best we could interpret the labels. We regret any omissions or errors. Always refer to product labels before using a pesticide or replanting into treated fields.

KEY

Crop

All = All crops not specified
AL = Alfalfa
B = Barley
C = Corn
CA = Canola
CL = Clovers
CT = Cotton
GS = Grain Sorghum

O = Oat
P = Peanuts
R = Rice
S = Soybeans
SF = Sunflowers
SG = Small Grains
W = Wheat

Timing

I = Immediately
FY = Following year
(usually spring)

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE Preplant Non-incorporated [Water Seeded Rice Only]				
thiobencarb @ 4 lb/A	Weedy rice.	Bolero 8E 4 pt/A.	After final seedbed preparation.	Flood within 2 to 3 but no sooner than 1 day after Bolero application. If pin-point flood management is used, reflood within 3 to 5 days to prevent loss of Bolero. Use pregerminated seed. Severe injury has occurred in some cases with this recommendation. Contact company for full instructions before using.
Preemergence [Dry Seeded Rice Only] For information on burndown herbicides see p. 21 and p. 26, WEED RESPONSE RATINGS FOR BURNDOWN HERBICIDES.				
quinclorac @ 0.25 to 0.5 lb/A	Barnyardgrass, broadleaf signalgrass, morningglory, hemp sesbania, northern jointvetch.	Facet L or QuinStar 4L 22 to 43 oz/A or 8 to 16 oz/A	Apply to smooth seedbed with rice seed covered by soil. Rice seed exposed to the spray may be severely injured. Use the lower rate on sandy soils; use the higher rate on clays.	Tomatoes and cotton are extremely sensitive to Facet and QuinStar. For more consistent results, follow the Delayed Preemergence instructions below. If weeds emerge after application, rainfall or flushing may be required for activation and reactivation. Fields treated with Facet or QuinStar should be scouted for smartweed, nutsedge and sprangletop and treated if necessary. Common purslane will not be controlled by Facet or QuinStar. However, it should be controlled by the flood.
clomazone @ 0.3 to 0.6 lb/A or glyphosate + clomazone @ 1 lb/A + 0.3 to 0.6 lb/A or paraquat + clomazone @ 0.625 + 0.3 to 0.6 lb/A or quinclorac + clomazone @ 0.25 to 0.5 + 0.3 to 0.6 lb/A	Barnyardgrass, broadleaf signalgrass, sprangletop and other annual grasses.	Glyphosate (4 lb/gal formulations) + Clomazone (3 lb/gal formulations) or Paraquat (3 lb/gal formulations) + Clomazone (3 lb/gal formulations) or Clomazone (3 lb/gal formulations) + Facet L or QuinStar 4L	Apply from planting to rice emergence to smooth seedbed with rice seed covered by soil. Injury may increase with lower seeding rates. May be used in conventional, stale seedbed and no-till culture. If emerged vegetation is present, add glyphosate at 1 qt glyphosate or equivalent, or paraquat at 1.67 pt/A. Using less glyphosate can result in failure due to tank mix antagonism. *Add Permit or Permit Plus for emerged sedges.	If grasses emerge after application, rainfall or flushing may be needed for activation and reactivation. Grasses may emerge white, however usually die off after emergence. Application on newly cut ground can result in severe injury and stand loss. Rice in low areas of the field, or where water is prone to stand, may show more injury. Fields treated with clomazone should be scouted for nutsedge and flatsedge species and other broadleaf weeds and treated if necessary. Clomazone is not a stand-alone herbicide. It should be used in a herbicide program to control these species. Scout carefully for escaped grasses prior to flooding. Do not exceed 0.8 lb ai/A per year of clomazone. Clomazone plus glyphosate can be applied up to 14 days prior to planting. However, sequential post grass herbicides may be needed due to shorter residual.
clomazone @ 0.3 to 0.6 lb/A + imazosulfuron @ 0.304 lb/A	Grasses plus nutsedge and other broadleaves.	Clomazone (3 lb/gal formulations) + League 75 WG 0.8 to 1.6 pt/A + 6.4 oz/A.	Apply from planting to rice emergence to smooth seedbed with rice seed covered by soil. May be used in conventional, stale seedbed and no-till culture. If emerged vegetation is present, add glyphosate at 1 qt glyphosate or equivalent, or paraquat at 1.67 pt/A. Using less glyphosate can result in failure due to tank-mix antagonism.	Keep away from soybeans and ground to be planted to soybean. Do not exceed 6.4 oz League per season. May carry over to soybean on very high pH soils.
clomazone @ 0.3 to 0.6 lb/A + saflufenacil @ 0.066 lb/A	Grasses plus annual flatsedges and other broadleaves.	Clomazone (3 lb/gal formulations) + Sharpen 0.8 to 1.6 pt/A + 3 oz/A	Apply from planting to rice emergence to smooth seedbed with rice seed covered by soil. May be used in conventional, stale seedbed and no-till culture. If emerged vegetation is present, add glyphosate at 1 qt glyphosate or equivalent, or paraquat at 1.67 pt/A. Using less glyphosate can result in failure due to tank-mix antagonism.	See above precautions on rice injury potential. Do not exceed 6 oz/A Sharpen per season.
clomazone @ 0.3 to 0.6 lb/A + halosulfuron + prosulfuron @ 0.031 + 0.018 lb/A	Grasses plus yellow nutsedge and broadleaves.	Clomazone (3 lb/gal formulations) + Gambit 0.8 to 1.6 pt/A + 1 oz/A.	Apply from planting to rice emergence to smooth seedbed with rice seed covered by soil. If emerged vegetation is present, add glyphosate at 1 qt glyphosate or equivalent, or paraquat at 1.67 pt/A. Using less glyphosate can result in failure due to tank-mix antagonism.	See above precautions on rice injury potential. Do not exceed 2 oz/A Gambit per season or 0.063 lb/A of halosulfuron. Use on high pH soils may stunt or tyellow rice, temporarily.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE Delayed Preemergence [Dry Seeded Rice Only]				
thiobencarb @ 4 lb/A	Sprangletop, barnyardgrass and aquatic weeds.	Bolero 8E 4 pt/A.	Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting. Rice seed must have imbibed its germination water prior to application.	Bolero delayed preemergence will usually require follow-up treatment for complete grass control prior to flooding. Apply to soil that has been sealed by rain or flush. Application to rice stressed by high salt and/or high pH soils may cause excessive rice injury. Drain surface water before application. Rainfall or flush required for activation if soil begins to crack or if grass begins to germinate. Does not control broadleaf signalgrass. If barnyardgrass or sprangletop has emerged, use tank mix with propanil.
quinclorac @ 0.25 to 0.5 lb/A	Barnyardgrass, broadleaf signalgrass, morningglory, hemp sesbania, northern jointvetch.	Facet L or QuinStar 4L 22 to 43 oz/A or 8 to 16 oz/A. Add 1 qt/A crop oil concentrate if weeds have emerged. Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting.	Apply before or after rain or flushing. Rice seed that is exposed to the spray may be severely injured. Best weed control is obtained if soil surface is smooth and wet, especially on clays.	If weeds emerge after application, rainfall or flushing may be required for activation and reactivation. Fields treated with Facet should be watched for smartweed, nutsedge and sprangletop and treated if necessary. Common purslane will not be controlled by Facet. However, it should be controlled by the flood. Tomatoes and cotton are extremely sensitive to Facet drift.
pendimethalin + clomazone @ 0.71 + 0.30 to 1.02 + 0.42 lb/A	Barnyardgrass, fall panicum, sprangletop, broadleaf signalgrass, crabgrass, and small-seeded broadleaf weeds.	RiceOne CS 35 to 50 oz/A.	Delayed preemergence through 4-tiller rice.	Rice seed must have imbibed water. Apply after rain or flush to seal soil. If grass weeds have emerged, tank-mix with propanil or follow with propanil.
quinclorac + thiobencarb @ 0.25 to 0.5 + 3 to 4 lb/A	Barnyardgrass, broadleaf signalgrass, fall panicum, sprangletop, morningglory, hemp sesbania, northern jointvetch.	Facet L or QuinStar 4L + Bolero 8E 22 to 43 oz/A or 8 to 16 oz/A + 3 to 4 pt/A. Research has shown 2 pt/A Bolero effective if sprangletop is only target weed for the Bolero in this mixture, and sprangletop density is light.	Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting. May be applied early postemergence later than Bolero applied alone. Rice seed exposed to the spray may be severely injured. Rice seed must have imbibed germination water prior to application.	Apply to soil that has been sealed by rain or flush. Application to rice stressed by high salt and/or high pH soils may cause excessive rice injury. Drain surface water before application. Rainfall or flush required for activation and reactivation if soil begins to crack or if grass begins to germinate. Tomatoes and cotton are extremely sensitive to Facet drift.
quinclorac + pendimethalin @ 0.25 to 0.5 + 1 lb/A	Barnyardgrass, broadleaf signalgrass, fall panicum, sprangletop, morningglory, hemp sesbania, northern jointvetch.	Facet L or QuinStar 4L + Prowl H₂O 3.8 CS 22 to 43 oz/A or 8 to 16 oz/A + 2.0 pt/A.	Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting. May be applied early postemergence later than Bolero applied alone. Rice seed exposed to the spray may be severely injured. Rice seed must have imbibed germination water prior to application.	Apply to soil that has been sealed by rain or flush. Drain surface water before application. Rainfall or flush required for reactivation. This has been an excellent broad spectrum program in University trials. Tomatoes and cotton are extremely sensitive to Facet drift.
glyphosate + thiobencarb @ 1.0 + 4 lb/A	Emerged weeds, residual control of sprangletop, barnyardgrass, and aquatic weeds.	Glyphosate (4 lb/gal formulations) + Bolero 2 pt/A + 4 pt/A.	Apply 1 to 5 days before rice emergence or about 5 to 9 days after planting. May be applied early postemergence later than Bolero applied alone. Rice seed exposed to the spray may be severely injured. Rice seed must have imbibed germination water prior to application.	EMERGED RICE WILL BE KILLED.
pendimethalin @ 0.75 to 1 lb/A	Barnyardgrass, fall panicum, sprangletop, broadleaf signalgrass, crabgrass.	Prowl H₂O 3.8 CS 1.5 to 2.0 pt/A. Use low rate for sandy loam soils and high rate for all others.	Apply 1 to 5 days before emergence or about 5 to 9 days after planting. DO NOT apply preplant incorporated or immediately after planting. Rice seed must have imbibed germination water prior to application.	Rice seed must have imbibed germination water. Apply after rain or flush to seal soil. If grass weeds have emerged, add propanil or follow with propanil.
pendimethalin + thiobencarb @ 1 + 3 lb/A	Barnyardgrass, fall panicum, sprangletop, broadleaf signalgrass, suppression of aquatics and weedy rice.	Prowl H₂O 3.8 CS + Bolero 8 EC 2.0 + 3 pt/A.	Apply 1 to 5 days before rice emergence, usually about 5 to 9 days after planting. Rice seed must have imbibed its germination water prior to application.	This treatment is an option to consider in areas where drift to sensitive plantings is a problem. Some injury to rice may occur under cool, wet conditions.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE				
Clearfield Rice System				
imazethapyr @ 0.063 to 0.095 lb/A followed by 0.063 to 0.095 lb/A	Weedy rice, barnyardgrass, broadleaf signalgrass, sprangletop, fall panicum, yellow nutsedge. Suppression of some aquatic broadleaf species.	Newpath 2 AS 4 to 6 oz/A ppi. Follow with 4 to 6 oz/A post-emergence. Add a non-ionic surfactant to post-application. The 6-oz rate may provide longer residual from a single application. However, rates higher than 4 followed by 4 oz/A have not improved weed control when properly timed.	Preplant incorporated or preemergence followed by postemergence. Apply 4 oz/A preplant incorporated up to 7 days prior to planting or preemergence immediately following planting. Apply postemergence treatment when rice is in 3- to 5-leaf stage. Do not exceed 6 oz/A per application on conventional CL varieties and 4 oz/A per application on CL hybrids. Under cloudy, cool, wet conditions, Newpath may injure hybrid rice.	Use on Clearfield rice varieties only. Preferred method for soil application is preplant incorporated at the time of final seedbed preparation. Incorporate during final seedbed preparation pass. Flush for activation if rainfall does not occur within a few days of planting. Repeat flushing as needed to keep soil-applied treatment active. Tank mixing with propanil or other suitable products will be required for control of weeds such as hemp sesbania, northern jointvetch and eclipta. To prevent outcrossing between Clearfield rice and weedy rice, strive to achieve 100 percent weedy rice control, allowing no escapes. Avoid post applications to hybrids when cool temperatures persist. The University of Arkansas recommends growing Clearfield rice in the same field only one year in a row. Conventional rice varieties cannot be planted the year following Clearfield rice due to carryover of the Newpath injuring the conventional rice.
Sequential Post Program				
imazethapyr @ 0.063 to 0.095 lb/A followed by 0.063 to 0.095 lb/A	Same as above. Suppression of sprangletop. Improved control of barnyardgrass and weedy rice on heavy clays and reduced/no-till or chicken litter fields.	Newpath 2 AS 4 to 6 oz/A followed by 4 to 6 oz/A. Add nonionic surfactant at 0.25% v/v.	4 oz/A on 1-leaf to 2-leaf weedy rice followed by 4 oz/A approximately 14 days later.	Same as above. A soil-applied herbicide, such as clomazone, should be used for sprangletop control and to aid in the control of annual grass. Most aquatic suppression will be lost, so be prepared to make appropriate tank-mixtures.
imazethapyr + quinclorac @ 0.063 + 0.30 lb/A followed by imazethapyr @ 0.063 to 0.095 lb/A	Same as above with improved barnyardgrass, hemp sesbania and northern jointvetch control.	Clearpath followed by Newpath 0.5 lb/A followed by 4 to 6 oz/A. Add 1% v/v crop oil concentrate with Clearpath on enhanced tolerance varieties.	Preemergence followed by post-emergence or same as above.	Same as above. See Facet Restrictions and Precautions.
imazamox @ 0.04 lb/A	Late-season suppression of weedy rice.	Beyond Xtra 1 AS 5 oz/A. Surfactant or crop oil concentrate required.	After Newpath or Clearpath has been applied. Apply to weedy rice prior to seedhead emergence. Apply to conventional Clearfield rice no later than 14 days past panicle initiation. Apply to hybrid Clearfield rice no later than panicle initiation.	Late application of Beyond Xtra may help prevent weedy rice outcrossing with Clearfield rice varieties. Do not apply more than 15 ounces per year.
Beyond Xtra-Only Program				
imazamox @ 0.04 lb/A	Grasses and some other broadleaf species.	Beyond Xtra 1 AS 5 oz/A. Surfactant or crop oil concentrate required.	Can be applied from 4-leaf rice to panicle initiation (green ring) plus 14 days for varieties.	Use on Clearfield rice varieties only. A Beyond Xtra- only program allows for Clearfield rice to be grown, and removes the rotation restriction of not allowing conventional or Provisia/Max-Ace rice to be planted the following year. Do not apply more than 15 oz/A per year. Do not make more than 3 applications per year. Wait at least 5 days between applications.

In order to prevent the development of ALS-resistant (WSSA Group 2) barnyardgrass, the University recommends using an additional barnyardgrass herbicide with a different WSSA Group # (see table on pages 90-91). **The University also recommends a standard residual program regardless of trait technology planted to maximize barnyardgrass and other weed control.**

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE				
FullPage Rice System				
(Preface and Postscript are not effective at controlling Newpath and Beyond Xtra-resistant weeds.)				
imazethapyr @ 0.063 to 0.095 lb/A followed by 0.063 to 0.095 lb/A	Weedy rice, barnyardgrass, broadleaf signalgrass, sprangletop, fall panicum, yellow nutsedge. Suppression of some aquatic broadleaf species.	Preface 4 to 6 oz/A ppi. Follow with 4 to 6 oz/A post-emergence. Add a non-ionic surfactant to post-application. The 6-oz rate may provide longer residual from a single application. However, rates higher than 4 followed by 4 oz/A have not improved weed control when properly timed.	Preplant incorporated or pre-emergence followed by post-emergence. Apply 4 oz/A preplant incorporated up to 7 days prior to planting or preemergence immediately following planting. Apply post-emergence treatment when rice is in 3- to 5-leaf stage.	Use on FullPage rice varieties only. Preferred method for soil application is preplant incorporated at the time of final seedbed preparation. Incorporate during final seedbed preparation pass. Flush for activation if rainfall does not occur within a few days of planting. Repeat flushing as needed to keep soil-applied treatment active. Tank mixing with propanil or other suitable products will be required for control of weeds such as hemp sesbania, northern jointvetch and eclipta. To prevent outcrossing between Clearfield rice and weedy rice, strive to achieve 100 percent weedy rice control, allowing no escapes. Avoid post applications to hybrids when cool temperatures persist. The University of Arkansas recommends growing Clearfield or FullPage rice in the same field only one year in a row. Conventional rice varieties cannot be planted the year following Clearfield or FullPage rice due to carryover of the imazethapyr injuring the conventional rice.
Sequential Post Program				
imazethapyr @ 0.063 to 0.095 lb/A followed by 0.063 to 0.095 lb/A	Same as above. Suppression of sprangletop. Improved control of barnyardgrass and weedy rice on heavy clays and reduced/no-till or chicken litter fields.	Preface 4 to 6 oz/A followed by 4 to 6 oz/A. Add nonionic surfactant at 0.25% v/v.	4 oz/A on 1-leaf to 2-leaf weedy rice followed by 4 oz/A approximately 14 days later.	Same as above. A soil-applied herbicide, such as clomazone, should be used for sprangletop control and to aid in the control of annual grass. Most aquatic suppression will be lost, so be prepared to make appropriate tank-mixtures.
imazamox @ 0.04 lb/A	Late-season suppression of weedy rice.	Postscript 5 oz/A. Surfactant or crop oil concentrate required.	After Preface has been applied. Apply to weedy rice prior to seedhead emergence.	Late application of Postscript may help prevent weedy rice outcrossing with FullPage rice varieties. Do not apply more than 15 ounces per year.
imazamox + quinclorac @ 0.04 + 0.38 lb/A	Postemergence and residual control of grasses. Improved control of some broadleaf species, particularly hemp sesbania and northern jointvetch.	FullScript 3.3 L 16 oz/A. Surfactant or crop oil concentrate required.	Can be applied from 1-leaf rice to 7 days prior to panicle initiation (green ring).	Use on FullPage rice cultivars only. If Preface is not applied prior to FullScript, it allows for FullPage rice to be grown, and removes the rotation restriction of not allowing conventional or Provisia/Max-Ace rice to be planted the following year. Do not apply more than 20 oz/A per year. Do not make more than 1 application per year. See Facet restrictions and precautions.
Postscript-Only Program				
imazamox @ 0.04 lb/A	Grasses and some other broadleaf species.	Postscript 5 oz/A. Surfactant or crop oil concentrate required.	Can be applied from 1-leaf rice to panicle initiation (green ring) plus 14 days.	Use on FullPage rice varieties only. A Postscript-only program allows for FullPage rice to be grown, and removes the rotation restriction of not allowing conventional or Provisia/Max-Ace rice to be planted the following year. Do not apply more than 15 oz/A per year. Do not make more than 3 applications per year. Wait at least 5 days between applications.
In order to prevent the development of ALS-resistant (WSSA Group 2) barnyardgrass, the University recommends using an additional barnyardgrass herbicide with a different WSSA Group # (see table on pages 90-91). The University also recommends a standard residual program regardless of trait technology planted to maximize barnyardgrass and other weed control.				

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
Provisia Rice System				
quizalofop-P-ethyl @ 0.07 lb/A followed by 0.07 lb/A followed by 0.08 lb/A.	Annual grasses and weedy rice.	Provisia 0.88 EC 10 oz/A followed by 10 oz/A followed by 11 oz/A. Add 1 % v/v COC.	Sequential program 2-3 leaf followed by 4-5 leaf (preflood) followed by postflood. Apply first application to small grass.	Use only on Provisia rice varieties. Use a good residual broadleaf and grass program at planting. Use broadleaf and sedge tank mixes in the first and second applications. Avoid broadleaf and sedge tank mixtures in the third (final) application. Do not mix with propanil or Grandstand. Flood as soon as possible following the second application for best result. Do not exceed 31 oz/A per year. Crop injury has occurred following sequential applications under certain environmental conditions.
Quizalofop-P-ethyl @ 0.109 lb/A followed by 0.109 lb/A.	Annual grasses and weedy rice.	Provisia 0.88 EC 15.5 oz/A followed by 15.5 oz/A. Add 1% v/v COC.	Sequential program at higher rate preferred if grass larger than 3 lf at first application.	See above.
quizalofop-P-ethyl + florypyrauxifen-benzyl @ 0.07 + 0.013 lb/A.	Broad-spectrum weed control.	Provisia 0.88 EC + Loyant 0.21 EC 10 oz/A + 8 oz/A. Add 1% v/v COC.	Preflood. Second application in a sequential Provisia program.	See above comments.
Max-Ace Rice System				
quizalofop-P-ethyl @ 0.11 lb/A followed by 0.11 lb/A.	Annual grasses and weedy rice.	Highcard 0.88 EC 15.5 oz/A followed by 15.5 oz/A. Add 1% v/v COC.	Sequential program 2-3 leaf rice followed by 4-5 leaf (preflood). Applications should begin when barnyardgrass and other grass weeds are no larger than 3 leaf.	Use only on Max-Ace rice varieties. Use a good residual broadleaf and grass program at planting. Use broadleaf tank mixes in first application. Avoid broadleaf and sedge tank mixtures in second application. Do not mix with propanil or Grandstand. The addition of a residual grass herbicide such as Prowl, Facet L, or clomazone to applications of Highcard is highly encouraged. Preferred broadleaf and sedge tankmix partners are Permit, Permit Plus, Gambit, and Loyant. Flood as soon as possible following final application for best result. Do not exceed 31 oz/A per year. Crop injury has occurred following sequential applications under certain environmental conditions. Highcard herbicide performance is slower than Provisia herbicide. Remember, due to the safener in Highcard, sequential applications are required for successful control.

*Avoid growing Provisia/Max-ace rice in consecutive years.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
fenoxaprop @ 0.078 to lb/A	Barnyardgrass, broadleaf signalgrass, fall panicum, loosehead sprangletop, seedling johnsongrass. Suppression of rhizome johnsongrass.	Ricestar HT 0.58 EC 24 oz/A.	Small, actively growing grasses. Barnyardgrass must be less than or equal to 4-leaf. Best results are obtained when applied early POST as a part of a planned program. Apply to 3lf rice.	Excellent soil moisture is critical for good activity. Tank mixing with broadleaf and sedge herbicides can result in loss of grass activity. The greatest antagonism has been observed with Aim, Permit, Permit Plus and Gambit. This treatment is most effective on small, actively growing grasses. It is not an effective salvage herbicide. Expect reduced control when temperatures increase above 90°F.
quinclorac + cyhalofop @ 0.25 to 0.50 lb/A + 0.28 lb/A	Barnyardgrass, sesbania, eclipta and johnsongrass.	Facet L or QuinStar 4L + Clincher 2.38 EC 22 to 43 oz/A or 8 to 16 oz/A + 15 oz/A. Add 1 qt/A of COC.	Small, actively growing weeds. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Do not drift on cotton or tomatoes. Follow State Plant Board recommendations. Excellent soil moisture is needed for good activity. Do not add Facet if sprangletop is present. Expect reduced control when temperatures increase above 90°F.
quinclorac + fenoxaprop @ 0.25 to 0.50 lb/A + 0.11 lb/A	Annual grasses, sesbania, eclipta, and johnsongrass.	Facet L or QuinStar 4L + Ricestar HT 0.58 EC 22 to 43 oz/A or 8 to 16 oz/A + 24 oz/A.	Small, actively growing weeds. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Do not drift on cotton or tomatoes. Follow State Plant Board recommendations. Expect reduced control when temperatures increase above 90°F.
bispyribac + quinclorac @ 0.021 to 0.034 + 0.258 to 0.422 lb/A	Barnyardgrass, broadleaf signalgrass, smartweed, several other broadleaves.	Rinde 22 to 36 oz/A. Must use proper adjuvants. See label for recommendations.	Early postemergence, 3-lf rice to pre-flood. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Do not exceed 36 oz/A per year. Do not drift onto susceptible crops; follow Arkansas State Plant Board recommendations.
propanil + bensulfuron methyl @ 3 to 4 lb/A + 0.028 to 0.038 lb/A	Yellow nutsedge, rice flatsedge, morningglories, hemp sesbania, northern jointvetch, redstem eclipta.	Propanil (4 lb/gal) + Londax 60DF 3 to 4 qt/A + 0.75 to 1 oz/A. Use 0.5 oz/A if applying sequentially with propanil. or Duet 4.03 EC 3 to 4 qt/A. For increased control of nut-sedge, add 0.25 oz/A of Permit.	Apply 1 to 7 days prior to establishment of permanent flood.	For best results, maintain permanent flood and keep water as static as possible.
halosulfuron @ 0.047 lb/A	Yellow nutsedge, flatsedge and hemp sesbania. May be used for late-season seedhead suppression of northern jointvetch and hemp sesbania.	Permit or Halomax 75 WG 1 oz/A. Add a nonionic surfactant or crop oil concentrate.	Apply to emerged weeds prior to rice emergence until 48 days prior to harvest.	Aerial or ground application. Avoid drift to non STS/BOLT soybeans. Do not apply within 48 days of harvest.
halosulfuron + thifensulfuron @ 0.031 + 0.004 lb/A to 0.062 + 0.008 lb/A.	Same as Permit with better control of smartweed and other broadleaf weeds.	Permit Plus 75 WG 0.75 to 1.5 oz/A. Add 1% crop oil concentrate or MSO.	Apply to emerged weeds prior to rice emergence until 48 days prior to harvest.	Aerial or ground application. Avoid drift to non STS/BOLT soybeans. Do not apply within 48 days of harvest. Do not exceed 1.5 oz/A/Year.
fluoridone @ 0.11 to 0.15 lb/A	Pigweed control. Suppression of barnyardgrass, morningglory spp., and hemp sesbania. Tank-mix with Loyant (8oz/A) for pigweed control.	Brake 12 to 16 oz/A.	Apply from 3-leaf rice to postflood. 30 day PHI. Do not apply PRE or DPRE as severe injury can occur.	Ground applications only. Brake only has residual activity for weed control, there is no POST activity. The best fit for Brake is in a row rice system in areas where no flood occurs. Severe injury may occur if applied PRE or DPRE and in areas of field that become flooded. Differences in cultivar tolerance have also been observed. Discuss cultivar selection with your SePRO representative prior to an application. Do not apply to cut ground as severe injury is likely.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE				
Postemergence [cont.]				
halosulfuron + prosulfuron @ 0.031 to 0.063 + 0.018 to 0.036 lb/A	Similar to Permit Plus, broader spectrum and short residual in broadleaf weeds.	Gambit 79 WDG 1 to 2 oz/A. Add 1% v/v crop oil concentrate or MSO.	Apply to emerged weeds from prior to rice emergence until 48 days prior to harvest. Use lower rate prior to rice emergence.	Aerial or ground application. Avoid drift to non-STs, STs, and BOLT soybeans as severe crop injury will result. Do not apply within 48 days of harvest. 10-month rotational restriction to soybean. Do not apply 10 days before or 7 days after organophosphate application. Use on high pH soils may stunt or yellow rice temporarily.
propanil + halosulfuron @ 3 to 4 lb/A + 0.031 to 0.063 lb/A	Yellow nutsedge, flatsedges, morningglories, eclipta, hemp sesbania and northern jointvetch.	Propanil + Permit 3 to 4 qt/A or equivalent + 0.67 to 1 oz/A Permit.	Apply to emerged weeds. Follow any Permit and propanil restrictions.	See propanil or Permit above.
propanil + thiobencarb @ 3 + 3 lb/A	Barnyardgrass, sprangletop, broadleaf signalgrass, flatsedge and aquatic weeds. (Refer to rating table for more detail.)	Propanil + Bolero 8E 3 qt/A + 3 pt/A. or RiceBeaux 6 SC 4 qt/A.	Refer to table on propanil for optimum timing according to weed size. If rice is water seeded, apply only after rice is well rooted and usually in the 2-leaf stage. Best results if applied prior to 3-leaf rice.	Apply to soil that has been sealed by rain or flush. Application to rice stressed by high salt and/or high pH soils may cause excessive rice injury. Drain any flood or surface water from field. Rainfall or flush will be needed for activation if soil begins to crack or weeds begin to germinate. Provides up to 3 weeks residual.
propanil + thiobencarb @ 3 + 3 lb/A fb propanil + bentazon @ 1 + 0.75 lb/A	ALS-resistant sedges.	RiceBeaux fb propanil + Basagran 4 qt fb 1 qt + 1.5 pt/A.	Apply RiceBeaux at 1- to 2-leaf rice fb propanil + Basagran on 4-inch sedges.	Option for ALS-resistant sedges.
propanil + thiobencarb fb propanil + thiobencarb @ 2 to 3 + 2 fb 2 to 3 + 2 lb/A	Same as above.	Propanil + Bolero 2 to 3 qt/A + 2 pt/A followed by 2 to 3 qt/A + 2 pt/A.	Time first application according to early propanil timing above. Repeat the application immediately prior to flooding.	See above comments. In addition, this treatment will provide an extended period of residual control often needed with semi-dwarf rice varieties.
propanil + pendimethalin @ 3 to 4 lb/A + 0.75 to 1 lb/A	Same as above.	Propanil + Prowl EC 3 to 4 qt/A + 1.8 to 2.4 pt/A.	Apply to rice in spiking to 3-leaf stage. Refer to table (p. 100) for propanil for optimum timing according to weed size.	Dry-seeded rice only. Soil should be sealed by rain or flush. Drain any surface water. Rainfall will be needed for activation. Gives residual control up to 2 weeks. Residual control from Prowl reduced after flooding, flushing or several days of heavy rainfall.
quinclorac + propanil @ 0.25 to 0.5 + 3 to 4	Barnyardgrass, broadleaf signal-grass, morningglory, hemp sesbania, northern jointvetch.	Facet L or QuinStar 4L + Propanil 22 to 43 oz/A or 8 to 16 oz/A + 3 to 4 qt/A + 1% v/v COC.	Apply to small, actively growing weeds. Follow adjuvant recommendation on label for propanil formulation used. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Rainfall or flushing may be required for activation or reactivation. Fields treated with Facet should be scouted for smartweed, nutsedge and sprangletop and treated if necessary. Tomatoes and cotton are extremely sensitive to Facet drift.
bispyribac @ 0.02 to 0.034 lb/A	Barnyardgrass, smartweed, ducksalad and johnsongrass.	Regiment 80 WP 0.4 to 0.67 oz/A. See label for approved surfactants. Must use proper adjuvants.	From 4-leaf rice to joint movement. Do not apply past joint movement.	May cause root pruning and stunting, especially if higher than labeled rates are applied. Studies have shown that the addition of UAN liquid fertilizer can improve weed control. Expect reduced control when temperatures increase above 90°F.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
penoxsulam @ 0.031 to 0.036 lb/A	Ducksalad, rice flatsedge, barnyard--grass, jointvetch and hemp sesbania. May be used for late-season seedhead suppression of northern jointvetch and hemp sesbania.	Grasp 2 SC 2 to 2.3 oz/A. Add 1 qt/A crop oil concentrate or methylated seed oil.	Apply early postemergence. Make only 1 application per year. *Water-seeded rice should be well-rooted prior to application. Do not apply within 60 days of harvest.	May cause root pruning and stunting, especially if higher than labeled rates are applied. Avoid high pH soils (>7.8) and soils with salt-related problems. Delay flooding for 3 days after application.
penoxsulam + triclopyr @ 0.03 to 0.035 lb/A + 0.26 to 0.29 lb/A	Barnyardgrass, rice flatsedge, morningglories, pigweed, duck-salad, dayflower, hemp sesbania, jointvetch, eclipta, smartweed and other broadleaf weeds.	Grasp Xtra 16 to 18 fl oz/A. Use of COC or MSO at 1 qt/A recommended.	From 2- to 3-leaf rice to ½-inch internode.	Avoid high pH soils (>7.8) and soil with salt-related problems. Clearfield varieties/hybrids have slightly higher tolerance compared to non-Clearfield varieties/hybrids. Delay flooding for 3 days after application to dry soil.
penoxsulam + florypyrauxifen-benzyl @ 0.036 + 0.021 lb/A	Barnyardgrass, broadleaf signalgrass, ALS-susceptible annual flatsedges, and other broadleaf weeds.	Novixid 27.4 oz/A	2-leaf rice up to 60 days preharvest. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Do not make more than 1 application at 27.4 oz/A per year. Do not mix with propanil. Visit www.NovixidTankMix.com for approved tank-mixtures. Rice injury may occur, see comments and precautions on Loyant.
saflufenacil @ 0.022 lb/A	Non-PPO-resistant pigweed and other broadleaf weeds.	Sharpen 1 oz/A +1% v/v COC.	2- to 3-leaf rice. Up to PI. Do not apply earlier than fully emerged second leaf.	Increased crop injury will occur under high soil moisture conditions and when applications are made prior to dew drying. Do not use MSO in crop. Avoid excessive tank mixes.
penoxsulam + cyhalofop @ 0.031 to 0.039 lb/A + 0.22 to 0.28 lb/A	Barnyardgrass, fall panicum, duck-salad, rice flatsedge, dayflower, eclipta and suppression of other broadleaf weeds.	Rebel EX 16 to 20 fl oz/A. Use of COC or MSO at 1 qt/A recommended.	Emergence to 60 days preharvest.	Delay flooding for 3 days if applied to dry soil.
florpyrauxifen-benzyl @ 0.026 lb/A	Broadleaves, aquatics, annual sedges, including ALS-resistant populations. Variable control of barnyardgrass. Suppression of Cat-tail.	Loyant 0.21 EC 1 pt/A. Add 0.5 pt/A MSO.	Preflood. Works best when used in a program following multiple residual herbicides. Check LoyantTankmix.com for approved tank mixtures. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Do not get on soybean. Apply no more than 7 days prior to flooding. No more than two applications per year, no more than 16 oz per application. High levels of injury have been observed on hybrid and medium grain cultivars as well as Diamond. Tank mixtures with Preface on Fullpage hybrid are not recommended due to potential for increased injury. Sequential applications are not recommended on hybrid due to potential for reduced grain yield. The addition of quinclorac (Facet) PRE or POST prior to an application of Loyant has increased observed injury. Temperatures above 90 F and excessive moisture or dry conditions at or near application will increase the risk for rice injury.
florpyrauxifen-benzyl @ 0.013 to 0.0195 lb/A	Less than 6-inch Palmer amaranth and rice flatsedge, including ALS-resistant populations. Suppression of Cat-tail.	Loyant 0.21 EC 8 to 12 oz/A. Add 0.5 pt/A MSO.	Preflood. Check LoyantTankmix.com for approved tank mixtures. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	See comments above. Less injurious than the full rate (1 pt/A) to susceptible varieties.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE Postemergence [cont.]				
propanil + bentazon @ 3 to 5 lb/A + 3/4 lb/A	Barnyardgrass, smartweed, cocklebur, redstem, yellow nutsedge, flatsedge, dayflower and spikerush.	Propanil + Basagran 3 to 5 qt/A + 1½ pt/A. If grass weeds are not present, Basagran alone at 1½ to 2 pt/A will control broadleaf weeds such as cocklebur or smartweed. Refer to rating table for comparison.	Apply up to 6-inch broadleaf weeds on all except cocklebur (10 inches), redstem (4 inches), and nutsedge (4 to 6 inches). Propanil timing for grasses should be applied as for propanil alone.	Dry- or water-seeded rice. See general propanil and follow information on state label. No residual control. Control of yellow nutsedge erratic if larger than 6 inches.
propanil + acifluorfen @ 3 lb/A + 0.2 lb/A	Morningglory, pigweed and hemp sesbania.	Propanil + Ultra Blazer 3 qt/A + 0.8 pt/A Ultra Blazer	When hemp sesbania is 1 to 5 feet and morningglory runners are less than 1 foot.	May cause tip burn on rice, but symptoms will be quickly outgrown. Do not apply more than 1 pt/A per season. The addition of Ultra Blazer reduces propanil activity on grasses. Do not apply past boot stage.
propanil + bentazon/acifluorfen @ 3 to 5 lb/A + 0.5 + 0.25 lb/A	Barnyardgrass, cocklebur, hemp sesbania, morningglory, redstem, smartweed and eclipta.	Propanil + Storm 3 to 5 qt/A + 1½ pt/A. (If grass weeds are not present, Storm alone will control broadleaf weeds such as cocklebur, morningglory and hemp sesbania.)	Apply to small, actively growing weeds, except cocklebur (10 inches), hemp sesbania (1 to 4 feet), and redstem (4 inches).	Dry- or water-seeded rice. No residual control. Storm contains the same active ingredient as in Ultra Blazer; therefore, reduced propanil activity on grasses may occur.
propanil + triclopyr @ 3 to 4 + 0.125 to 0.25 lb/A	Barnyardgrass, morningglories, hemp sesbania, northern jointvetch, eclipta, pigweed, redstem and cocklebur.	Propanil + Grandstand 3 SL 3 to 4 qt/A + ½ to ⅔ pt/A. Surfactant not required when tank-mixing Grandstand and propanil. If no grasses are present, the rate of propanil may be reduced to 1 to 2 qt/A.	Apply after rice reaches 2- to 3-leaf stage, and before weeds exceed 6 inches in height. Use no more than ½ pt/A if applying to 2- to 3-leaf rice and up to ⅔ pt/A if after 4-leaf stage.	Research has shown that injury can be caused by fertilizing and flooding soon after application. Flood should be delayed 3 days after application.
carfentrazone @ 0.02 lb/A	Morningglories, hemp sesbania, groundcherry and smartweed.	Aim 2 EC 1.25 oz/A. Add a nonionic surfactant.	Apply after rice reaches 2-leaf stage to small, actively growing weeds. Avoid applications from flag leaf emergence through harvest aid applications.	Thorough mixing and excellent sprayer agitation required. Avoid drift to cotton. Can burn or speckle rice, especially if foliage is wet. Symptoms are cosmetic and quickly outgrown.
carfentrazone + quinclorac @ 0.02 + 0.19 to 0.25 lb/A	Barnyardgrass, morningglories, hemp sesbania, groundcherry and other grass and broadleaf weeds.	Aim 2 EC + Facet L or QuinStar 4L 1.25 oz/A + 22 to 43 oz/A or 8 to 16 oz/A. Add crop oil concentrate at 1% v/v.	Apply after rice reaches 2-leaf stage. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	See Aim and Facet precautions.
carfentrazone + halosulfuron @ 0.02 + 0.047 lb/A	Smartweed early, morningglories, sedges and other broadleaves.	Aim 2 EC + Permit 75 WG 1.25 oz/A + 1 oz/A. Add surfactant.	Apply after rice reaches 2-leaf stage.	Possible antagonism on hemp sesbania.
triclopyr + propanil @ 0.25 to 0.375 lb ai/A + 1 lb/A	Morningglories, jointvetch, cocklebur, alligatorweed, eclipta, redstem and sicklepod.	Grandstand 3 SL + Propanil 2/3 to 1 pt/A + 1 qt/A.	After rice reaches 3- to 4-leaf stage.	Research has shown that injury can be caused by fertilizing and flooding soon after application. Flood should be delayed 3 days after application.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
triclopyr + acifluorfen @ 0.19 to 0.25 + 0.2 lb/A	Morningglories, jointvetch, hemp sesbania and cocklebur.	Grandstand 3 SL + Ultra Blazer 2L ½ to ¾ pt/A + 0.8 pt/A. NIS required with tank mix.	Apply after rice reaches 2- to 3-leaf stage.	Research has shown that injury can be caused by fertilizing and flooding soon after application. Flood should be delayed 3 days after application. Do not apply past ½-inch internode.
triclopyr + halosulfuron @ 0.25 lb ai/A + 0.031 to 0.063 lb/A	Morningglories, jointvetch, hemp sesbania, cocklebur and nutsedge.	Grandstand 3 SL + Permit 75 WG 0.67 pt/A + 0.67 to 1 oz Permit. Add 1% v/v COC or MSO.	From 2-leaf stage until after field is flooded.	Same as above. Do not apply within 48 days of harvest.
RICE				
Postemergence [After Flooding]				
cyhalofop @ 0.28 lb/A	Barnyardgrass, fall panicum and other annual grasses. Sequential applications of Clincher are recommended for suppression of Brooks paspalum, knotgrass and Nealley's sprangletop.	Clincher 2.38 EC 15 oz/A + 1 qt/A of COC or MSO.	Do not apply within 60 days of harvest. Apply to grasses in shallow flood. Best results have been achieved when applications are made no later than 7 days after flooding with 70% of the foliage exposed.	Do not apply within 60 days of harvest. Maintain flood after application. Do not tank-mix with broadleaf herbicides. (Later than 7 days after flood, adding 0.25 to 0.50 lb/A of Facet will improve control and consistency.) In salvage situations, 15 oz/A of Clincher can be followed by 10 oz/A of additional product. Apply approximately 10 days apart, preferably in an alternative spray pattern. Do not use more than 25 oz per year. Do not add Facet if sprangletop is present. Expect reduced control when temperatures increase above 90°F.
penoxsulam @ 0.044 lb/A	Suppression of barnyardgrass, jointvetch, hemp sesbania, eclipta and rice flatsedge.	Grasp 2 SC 2.8 oz/A + 1 qt/A COC or MSO.	Apply 7 to 10 days after flood. Not a salvage treatment.	At least 70% of target weed should be exposed (above flood). Good coverage is essential. Do not apply within 60 days of harvest.
benzobicyclon @ 0.33 lb/A	Sprangletop, annual flatsedges, aquatics. Possible weedy rice suppression. Suppression of Rice Cutgrass.	Rogue 12.6 oz/A. Add 1% v/v MSO.	Once permanent flood is established, apply within 7 days.	For Rogue to be effective, it must make contact with water and the flood must be held constant and deep (greater than or equal to 3 inches). Low spray volumes and small droplet sizes will reduce efficacy. Recommended only on zero-grade and straight levee fields. Use only highest rate for weedy rice suppression. Best control is achieved when weeds are at least 70% submerged. Rogue should not be applied to RiceTec medium grain hybrid RT3202 as severe injury will result.
2,4-D amine @ 0.48 to 1.43 lb/A	Broadleaf and aquatic weed control. Refer to rating table.	2,4-D amine 1 to 3 pt/A of 3.8 lb/gal.	Apply at correct DD50 threshold or when the first elongating internode begins movement to ½-inch long. Do not apply when internode exceeds ½-inch.	If rice injury occurs, apply 20 to 30 pounds of nitrogen within 5 days after phenoxy herbicide treatment. Apply additional nitrogen 10 to 14 days after the recommended mid-season stage for the variety. For specific nitrogen rates and timing, consult your county Extension agent. If for some reason nitrogen is applied first, a phenoxy herbicide can be safely applied 5 days after the nitrogen application, providing the first elongating internode is not longer than ½-inch. Application of 2,4-D is restricted in some counties. Do NOT mix with ACCase-inhibiting herbicides (Clincher and Ricestar) as grass control will be reduced.
GENERAL INFORMATION ON PHENOXY HERBICIDE. Follow State Plant Board Regulations. Drain field or lower flood sufficiently to expose weeds to herbicides before treatment. Phenoxy herbicides are hazardous to cotton and soybeans. AVOID DRIFT. Cotton is extremely sensitive to 2,4-D. Rain 1 to 6 hours after treatment may reduce effectiveness. Do not apply nitrogen during the 7 to 21 days before phenoxy herbicide application, since the nitrogen stimulates the rice plant growth, making it more susceptible to phenoxy treatment injury. Note: Not all brands of 2,4-D are labeled for use on rice. Choose a brand labeled for the intended use.				

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE Postemergence [After Flooding] [cont.]				
bensulfuron methyl @ 0.0375 to 0.063 lb/A	Ducksalad, redstem, eclipta, false pimpernel, gooseweed, day-flower, flatsedge, water hyssop, arrowhead and emerged yellow nutsedge.	Londax 60 DF 1 to 1.67 oz/A. Add 1% crop oil concentrate for emerged weeds.	For aquatics, apply within 5 days after flooding when target weeds are small and maintain flood at least 7 days. For water-seeded rice, apply as soon as possible after rice has pegged and flood stabilized. For emerged yellow nutsedge, when leaves are 3 to 4 inches above water surface.	Londax is highly water soluble, which requires non-moving water. Avoid pumping for 7 days after treatment, if possible. Activity is slow. Most consistent results are obtained on aquatics before or just at emergence.
acifluorfen @ 0.125 to 0.25 lb/A	Hemp sesbania (coffeebean).	Ultra Blazer 2L ½ to 1 pt/A. Add a surfactant.	When hemp sesbania is 1 to 5 feet tall. See DD50 program for specific begin and end dates.	Do not apply past the boot stage of rice. May cause tip burn on rice, but symptoms will be quickly outgrown. Do not apply more than 1 pt/A per season.
triclopyr + propanil @ 0.25 + 1 lb/A	Morningglories, hemp sesbania and northern jointvetch.	Grandstand 3 SL + Propanil ⅔ pt/A + 1 qt/A. Surfactant not required when tank-mixing with propanil.	Apply prior to ½-inch internode elongation. See DD50 program for details.	For the midseason applications, research has shown significant yield reductions when applied soon after ½-inch internode elongation. Also, make sure flood water covers soil surface and root area of plants. Note: This is in contrast to the recommendation for the early season application.
Colletotrichum gloeosporioides f sp. aeschynomene	Northern jointvetch (curly indigo).	LockDown 75 billion spores/A. See label for specific instructions.	Apply when northern jointvetch averages 8 to 24 inches tall and when plants have emerged through rice canopy. See DD50 printout for specific beginning and ending dates.	Expect slow results. Special sprayer cleanup and mixing instructions must be used. Refer to LockDown label for details. Late application near blooming stage of northern jointvetch may not allow enough time to prevent seed production or kill weeds before harvest. Does not control Indian jointvetch. Do not apply Benlate within 14 days before or after a LockDown application. If possible, do not apply Quadris, Tilt or Moncut within 14 days of LockDown, but applications down to 7 days before or after Lockdown likely will not reduce overall effectiveness. Very late afternoon to early evening or just prior to rainfall are optimal for application.
propanil + 2,4-D @ 3 to 4 lb/A + 0.75 to 1.25 lb/A	Barnyardgrass, broadleaf and aquatic weeds on levees.	Propanil + 2,4-D 3 to 4 qt/A + 1.5 to 2.5 pt/A.	Apply at correct DD50 date or when the first elongating internode begins movement to ½-inch long. Do not apply when internode exceeds ½-inch.	Use 5 gpa by air and 10 to 20 gpa by ground. Grower's risk treatment (see inside cover for explanation). Application of 2,4-D is restricted in some counties. Follow all phenoxy regulations.
propanil + acifluorfen @ 3 to 4 lb/A + 0.25 lb/A	Barnyardgrass, broadleaf and aquatic weeds on levees.	Propanil + Ultra Blazer 2L 3 to 4 qt/A + 1 pt/A.	See DD50 printout for specific beginning and ending dates.	Less effective than propanil + 2,4-D but is safer to use when cotton is grown nearby. Reduced activity on morningglories with runners greater than 1 foot.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
propanil + bentazon/aci-fluorfen @ 3 to 4 lb/A + 0.5 + 0.25 lb/A	Barnyardgrass, cocklebur, hemp sesbania, morningglory, red-stem, smartweed, dayflower and eclipta.	Propanil + Storm 3 to 5 qt/A + 1½ pt/A. [If grass weeds are not present, Storm alone will control broadleaf weeds such as cocklebur, morningglory and hemp sesbania.]	See DD50 printout for specific beginning and ending dates.	Less effective than propanil + 2,4-D but is safer to use when cotton is grown nearby. Reduced activity on morningglories with runners greater than 1 foot.
triclopyr + propanil @ 0.25 + 4 lb/A	Jointvetch, barnyardgrass and other broadleaves.	Grandstand + Propanil ¾ pt + 4 qt/A.	See Grandstand.	See Grandstand restrictions.
carfentrazone + propanil @ 0.02 + 4 lb/A	Pigweeds, morningglories and other broadleaves.	Aim 2 EC + Propanil 1.25 oz + 4 qt/A.	When pigweeds are 2 inches tall.	See Aim and propanil restrictions.
carfentrazone + quinclorac @ 0.02 + 0.375 lb/A	Groundcherry, morningglory and other broadleaf weeds.	Aim 2 EC + Facet 75 DF 1.25 oz + 0.5 lb/A.	Less than 6-inch weeds on levees. Prior to panicle initiation (PI).	See Aim and Facet restrictions.
halosulfuron @ 0.63 or halo-sulfuron + thifensulfuron @ 0.031 + 0.004 lb/A	Hemp sesbania and jointvetch (Suppression only).	Halomax/Permit or Permit Plus 75 WG 1.33 or 1 oz/A. Add 1% v/v COC or MSO.	48 day PHI.	
halosulfuron + prosulfuron @ 0.049 to 0.099 lb/A	Hemp sesbania and jointvetch (Control.)	Gambit 79 WDG 1 to 2 oz/A. Add 1% v/v COC or MSO.	48 day PHI.	

RICE

Postemergence [After Flooding] - Herbicide Coated on Fertilizer

florpyrauxifen-benzyl @ 0.026 lb/A	Hemp sesbania, jointvetch, goose-weed, aquatics, and annual flatsedges, including ALS-resistant populations. Will NOT control grasses. Suppression of Cat-tail.	Loyant 0.21 EC 16 fl oz/A coated on at least 150 lb/A fertilizer.	Postflood, 60 day PHI. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Do not apply Loyant to fertilizers that generate dust. There is less risk for injury to rice and to adjacent soybean than with a foliar spray. A flood must be maintained for effective control. Weeds must be at least 70% submerged.
florpyrauxifen-benzyl + penoxsulam @ 0.021 + 0.036 lb/A	Hemp sesbania, jointvetch, goose-weed, and aquatics. Does have some activity on grasses and annual flatsedges, including ALS-resistant populations.	Novixid 27.4 oz/A coated on at least 200 lb/A fertilizer.	Postflood, as soon as possible after permanent flood establishment. 60 day PHI. Prior to 7 days before panicle initiation (PI) or yield loss may occur.	Refer to Loyant notes. Weeds must be at least 70% submerged.
benzobicyclon @ 0.33 lb/A	Sprangletop, flatsedges, and aquatics.	Rogue 12.6 oz/A coated on at least 150 lb/A fertilizer.	Postflood, apply within 7 days of permanent flood establishment. 60 day PHI.	Flood must be maintained relatively constant. Refer to previous Rogue notes. Weeds must be at least 70% submerged.

RICE

Postemergence [After Flooding] - Barnyardgrass and Sprangletop Salvage

fenoxaprop + bispyribac-sodium @ 0.11 + 0.034 lb/A	Salvage barnyardgrass and sprangletop.	Ricestar HT + Regiment 24 + 0.67 oz/A. Use recommended adjuvants according to Regiment label.	Do not apply past panicle initiation (PI).	Ensure proper coverage occurs. Do not exceed 1.06 oz/A per year of Regiment or 30 oz/A per year of Ricestar HT.
fenoxaprop + imazamox @ 0.11 + 0.04 lb/A	Salvage barnyardgrass and sprangletop.	Ricestar HT + Beyond Xtra/Postscript 24 + 5 oz/A.	Only apply to Clearfield (Beyond Xtra) or FullPage (Postscript) rice varieties.	Do not apply past panicle initiation (PI). Do not exceed 30 oz/A per year of Ricestar HT, 10 oz/A per year of Beyond Xtra, or 15 oz/A per year of Postscript.

GENERAL INFORMATION ON SALVAGE TREATMENTS. Avoid using quinclorac (Facet L, QuinStar 4L, etc.) and/or florpyrauxifen-benzyl (Loyant) as a salvage option. Reduced efficacy and rice injury has been observed. Antagonism on sprangletop species from quinclorac mixed with Clincher or Ricestar HT has also been observed.

Crop, Situation, and Active Chemical Per Broadcast Acre	Weeds Controlled	Formulated Material Per Broadcast Acre	Time of Application	Method of Application and Precautions
RICE				
Levee Application				

LEVEE WEED CONTROL (LARGER WEEDS)^{1, 2}

HERBICIDES	WSSA Group #	Grasses					Broadleaf Weeds								
		Barnyardgrass	Bermudagrass	Broadleaf Signalgrass	Crabgrass	Foxtail sp.	Entire/lyleaf Morningglory	Groundcherry	Hemp Sesbania (coffeebean)	Northern Jointvetch	Palmer Amaranth	Palmleaf Morningglory	Prickly Sida (Teaweed)	Sicklepod	Smartweed
Clincher	1	7	3	6	0	6	0	0	0	0	0	0	0	0	0
Ricestar	1	6	2	4	3	8	0	0	0	0	0	0	0	0	0
Beyond Xtra	2	7	0	7	4	4	4	3	0	0	0	4	4	0	6
Grasp	2	7	2	0	0	3	6	3	5	7	0	4	0	5	5
Permit	2	0	0	0	0	0	5	0	8	6	0	3	2	5	6
Permit Plus	2	0	0	0	0	0	6	0	8	7	0	4	3	5	8
Regiment	2	8	0	0	0	4	4	4	7	7	0	0	2	6	9
2,4-D	4	0	0	0	0	0	8	6	9	5	8	9	9	9	9
2,4-D + propanil	4 + 5	6	4	6	2	0	8	5	9	8	9	8	8	8	7
Facet	4	6	0	5	3	4	6	6	7	5	0	5	4	3	7
Grandstand	4	0	0	0	0	0	9	5	7	7	4	9	3	6	7
Loyant	4	4	0	-	0	-	0	0	10	9	9	5	-	9	0
Propanil	5	6	4	6	3	0	4	3	9	8	6	3	2	4	7
Basagran	6	0	0	0	0	0	4	2	2	0	0	4	4	0	5
Aim	14	0	0	0	0	0	8	3	6	3	3	8	2	3	7
Sharpen	14	0	0	0	0	0	9	7	8	8	8	8	6	6	4
Ultra Blazer	14	0	0	0	0	0	7	3	9	0	4	6	2	0	6

¹For good levee broadleaf weed control, a combination of products is needed, especially where 2,4-D cannot be used. Applying Facet or other residuals prior to weed emergence is recommended in 2,4-D-restricted areas.

Ratings based on maximum use rates.

²Make sure to follow all appropriate herbicide cutoff timings as indicated on the label or rice injury and yield loss is likely to occur.



For more information on rice cultivar characteristics and other rice production recommendations, please scan the QR code to download the latest Division of Agriculture Rice Management Guide.

RICE				
Preharvest				
sodium chlorate @ 3 to 6 lb/A	Desiccating green weed foliage.	Sodium Chlorate Several brands and trade names are available. 0.5 to 1 gal/A of 6 lb/gal formulations.	When average moisture is 25% or below for varieties; or when moisture is 23% or below for hybrids.	See label for details. Harvest within 5 days after application to prevent overdrying, and potential milling quality reduction. See Rice Production Handbook for more details.
carfentrazone @ 0.023 lb/A	Morningglories.	Aim 2 EC 1.47 oz/A. Add 1% COC.	When average moisture is 25% or below for varieties; or when moisture is 23% or below for hybrids.	Aim has a 3-day PHI. Can be tank-mixed with sodium chlorate.