### WEED MANAGEMENT UPDATE

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## Optimize New Herbicides for Weed Control in Rice

- Loyant, florpyrauxifen-benzyl, it was available in the market in 2023 season
- Zembu, pyraclonil, approved by EPA/DPR and will be available in 2024
- Cliffhanger, benzobicyclon, approved by EPA/DPR and will be available in 2024
- Tetflupyrolimet, package submitted to EPA for registration
- Roxy Rice, package submitted to EPA for registration
- Prowl  $H_2O$  efficacy data completed

## Loyant

- Loyant is an auxin-type herbicide with novel binding site
- Rate: 1.00-1.33 pint/A, you can have two applications (total 2.66 pint/A), two weeks apart
- Adjuvant: Methylated seed oil, others
- Ground application: Apply in 10 gpa or more when apply by ground
- Water management: Lower water in the field to expose 70% of weed foliage for spray.
- Timing: Applied from 2 leaf stage with no exposed roots up to 60 days before harvest, late application may cause blanking.
- Tank mixes: with Clincher, Regiment, Granite, propanil and Grandstand. No varietal response
- Do not apply near beans, sunflower, tomato, cucurbit crops, other vegetable crops, grapes, fruit trees, nut trees, corn, grain sorghum, flowers, ornamental shrubs or trees, or other desirable broadleaf plants or trees, as injury may occur
- Recommendation: It must be used as part of a program that utilizes multiple residual herbicides in front of a timely application of Loyant

## Loyant

- Slight leaf tip symptoms for two weeks
- Weak on grasses, more control of barnyardgrass
- Good sedges and broadleaf control
- Need to be applied in herbicide program:
  - Bolero UltraMax. Cerano, Butte, Zembu followed by tankmix of Loyant with Clincher, Granite, SuperWham, or Regiment.

#### Base herbicide treatments prior to Loyant applications.

Treatment	Rate (Ib/A)	Timing
Bolero UltraMax	23.3	2 LF
Cerano 5MEG	12	DOS
Butte	9	DOS

### Follow-up Loyant applications

Treatment	Rate	Timing
Loyant	1.33 pt/A	4-5 LF
Loyant + SuperWham	1.33 Pt/A +5 qt/A	4 to 5 LF
Loyant + RebelEX	1.33 pt/A + 20 fl oz/A	4 to 5 LF
Loyant + Regiment	1.33 pt/A + 0.67oz/A	4 to 5 LF
Loyant fb Loyant	1.33 pt/A fb 1.33 pt/A	4 to 5 LF fb mid-tiller

# Loyant injury

- Slight leaf tip symptoms for two weeks. No increased in stunting from Bolero Ultra/Max and Butte and beaching from Cerano
- At 21 DAT, rice recovered from herbicide injury and appeared normal.

# Loyant Weed control

Control

- Rice flatsedge
- Ducksalad
- Redstem
- Monochoria
- California arrowhead
- Waterhyssop species
- Barnyardgrass biotype dependent

Suppressed

- Early water grass
- Late watergrass

Control- biotype and stage of growth dependent

- Smallflower umbrellasedge
- Ricefield bulrush

### Rice blanking as affected by Loyant applied at different timing

Treatments	Grain Blanking (%)	Seeds per panicle (#)	1000 grain weight (g)
Loyant 50 DAP, 1.33 pt/A	9	86	37.7
Loyant 50 DAP, 2.6 pt/A	11	83	36.2
Loyant 60 D PHI, 1.33 pt/A	25	84	42.1
Loyant 60D PHI, 2.66 pt/A	34	80	37.6
Untreated Control	14	82	42.4

### Loyant, florpyrauxifen-benzyl



Non-treated control



Bolero followed by Loyant



#### Butte followed by Loyant



RebelEx followed by Loyant

### Cattail control with Loyant

Treatment	Rate (pint/A)	Timing
Loyant	1.33	0 to 3 ft tall
Loyant	1.33	3 to 6 ft tall
Loyant/Loyant	1.33/1.33	0 to 3 ft tall fb 3 to 6 ft tall
Loyant	2.66	0 to 3 ft tall
Loyant	2.66	3 to 6 ft tall
Loyant/Grandstand	1.33/1.00	0 to 3 ft tall
Grandstand	1.00	3 to 6 ft tall
Untreated control		3 to 6 ft tall

MSO was added to all treatment at 0.5%

### Percent Cattail control with Loyant

Treatment	42 Days after treatment
Loyant	100
Loyant	100
Loyant/Loyant	100
Loyant	100
Loyant	100
Loyant/Grandstand	100
Grandstand	0
Untreated control	0

MSO was added to all treatment at 0.5%



### Cliffhanger vs. Butte herbicide

• Both Butte and Cliffhanger have benzobicyclon which is a pro herbicide: Benzobicyclon hydrolysate (a metabolite) is a potent HPPD inhibitor.



- The conversion process needs water
- Butte: benzobicyclon + halosulfuron, granule formulation
- Benzobicyclon (101 g ai/A) + halosulfuron (21 g ai/A)
- Field Use Rates: 7.5 9.0 lbs./A
- Cliffhanger: has only benzobicyclon, liquid formulation

## Cliffhanger

- It is a liquid formulation that can be applied by ground rig or airplane.
- Use rate is 8.4 to 10.3 oz/A. Use MSO at 1%, however, you can use NIS if herbicide partners require that.
- Application timing: As early as day of seeding to 82 days prior to harvest.
- Applied in a minimum of 4 inches of water.
- For optimum sedge control apply from preemergence to 5 leaf stage. Delay application resulted in reduce efficacy.
- For optimum sprangletop control apply from preemergence to 2.5 leaf stage. Delay application resulted in reduce efficacy.
- Do not apply 50 ft from susceptible crops
- Water holding: No warning on the label



#### Water Management

4" at time of application; 5-7 days static

### Efficacy of Cliffhanger (benzobicyclon) for weed control in rice

CROP INJURY (%)											WEED CONTROL (%)											
14 DAT						28 DAT			28 DAT							56 DAT						
HERBICIDES	RATE/ACRE	TIMING	BLEACHING	CHLOROSIS	STUNTING	STAND REDUCTION	BLEACHING	CHLOROSIS	STUNTING	STAND REDUCTION	WATERGRASSES	SPRANGLETOP	RICEFIELD BULRUSH	SMALLFLOWER	DUCKSALAD	REDSTEM	WATERGRASSES	SPRANGLETOP	RICEFIELD BULRUSH	SMALLFLOWER	DUCKSALAD	REDSTEM
UNTREATED 1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Butte	9 lbs	1 LSR	0	10	10	15	0	2.5	2.5	2.5	89.5	100	100	100	98.8	55	68	100	100	100	100	47.5
Butte	9 lbs	4.5 LSR	0	0	0	0	0	0	0	0	38.8	91.3	100	100	87.3	43.8	10	98.8	100	100	100	0
GWN-10235	10.3 fl oz	1 LSR	0	3.8	3.8	3.8	0	0	0	0	80	100	100	100	91.3	45	61.8	100	100	100	100	12.5
GWN-10235	12.6 fl oz	1 LSR	0	6.3	7.5	5	0	0	1.3	2.5	90	100	100	100	96.3	51.3	76.3	100	100	100	100	25
GWN-10235	10.3 fl oz	4.5 LSR	0	0	0	0	0	2.5	2.5	2.5	30	98.8	100	100	91.3	38.8	6.3	98.8	100	100	100	0
GWN-10235	12.6 fl oz	4.5 LSR	0	0	0	0	0	3.8	3.8	2.5	31.3	98.8	100	100	92.5	40	1.3	100	100	100	100	0

					CROP INJURY (%)									
			Г		20 0	DAT			40 (	DAT				
HERBICIDE PROGRAM	RATE/ACRE	TIMING		BLEACHING	CHLOROSIS	STUNTING	STAND REDUCTION	BLEACHING	CHLOROSIS	STUNTING	STAND REDUCTION			
Butte	9 lb	0.5-1 LSR		0	0	5	7	0	0	0	0			
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR		0	0	5	5	0	0	0	0			
Zembu	14.9 lb	DOS		0	0	16	42	•	•	10	40			
Cliffhanger + MSO	10.3 floz + 1% v/v	3.5-4 LSR		•	•	19	44	<u> </u>	•	10	40			
Cerano	10 lb	DOS		0	0	3	5	0	0	0	0			
Cliffhanger + MSO	10.3 floz + 1% v/v	3.5-4 LSR		·	~	· ·	1	· ·	×	•	•			
Cliffhanger + Granite SC + MSO	10.3 floz	3.5-4 LSR		0	0	5	5	0	0	0	0			
Cliffhanger + MSO	10.3  floz + 1%  v/v	0.5-1 LSR												
Regiment CA + Grandstand CA + Dyne-Amic	0.8 oz 0.5 pt + 5 floz	Mid-Tiller		0	0	5	5	0	0	0	0			
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR		~	•	,	-	_	•	~	•			
RebelEX CA + MSO	20 floz + 1.25 %v/v	Mid-Tiller		v	U	3	9	•	•	•	0			
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR												
Regiment CA + Dyne-Amic	0.8 oz + 5 floz	Mid-Tiller		0	0	5	5	0	0	0	0			
SuperWham! + COC	4 qt + 2.5 % v/v	Full-Tiller												
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR												
SuperWham! + Grandstand CA + COC	4 qt 0.5 pt + 2.5 % v/v	Full-Tiller		0	0	20	5	0	0	0	0			

#### WEED CONTROL (%)

					40 I	DAT					60 [	DAT		
HERBICIDE PROGRAM	RATE/ACRE	TIMING	WATERGRASSES	SPRANGLETOP	RICEFIELD BULRUSH	SMALLFLOWER	DUCKSALAD	REDSTEM	WATERGRASSES	SPRANGLETOP	RICEFIELD BULRUSH	SMALLFLOWER	DUCKSALAD	REDSTEM
Butte	9 lb	0.5-1 LSR	66	98	100	100	100	37	66	96	100	100	98	32
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR	83	100	100	100	100	27	80	100	100	100	92	40
Zembu	14.9 lb	DOS	100	100	100	100	100	100	100	100	100	100	100	100
Cliffhanger + MSO	10.3 floz + 1% v/v	3.5-4 LSR	100	100	100	100	100	100	100	100	100	100	100	100
Cerano	10 lb	DOS	04	00	100	100	100	72	02	100	100	100	07	OE
Cliffhanger + MSO	10.3 floz + 1% v/v	3.5-4 LSR	34	33	100	100	100	12	30	100	100	100	37	00
Cliffhanger +	10.3 floz	25.4150	cc	100	100	100	02	22	60	100	100	100	07	20
Granite SC + MSO	2.5 floz + 1% v/v	5.5-4 LSK	00	100	100	100	32	23	00	100	100	100	97	20
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR												
Regiment CA +	0.8 oz	Mid-Tillor	88	100	100	100	100	80	85	100	100	100	98	88
Grandstand CA + Dyne-Amic	0.5 pt + 5 floz	wid-rifer												
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR	~	-	00	-	-	~		~	~	2	01	00
RebelEX CA + MSO	20 floz + 1.25 %v/v	Mid-Tiller	84	/1	93	80	80	6/	/9	60	90	00	91	82
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR												
Regiment CA + Dyne-Amic	0.8 oz + 5 floz	Mid-Tiller	94	99	100	100	100	93	90	100	100	100	93	92
SuperWham! + COC	4 qt + 2.5 % v/v	Full-Tiller												
Cliffhanger + MSO	10.3 floz + 1% v/v	0.5-1 LSR												
SuperWham! +	4 qt	Full Tiller	91	99	100	100	100	90	91	100	100	100	98	94
Grandstand CA + COC	0.5 pt + 2.5 % v/v	run-riner												

## Zembu

- Pyraclonil, protox inhibitor formulated as a granule
- No resistant weeds confirm in California
- Control selected grasses, sedges, and broadleaf
- Weak on sprangletop and ricefield bulrush
- Optimum application timing is day of seeding
- Application rate is 12.4 to 14.9 lb/A
- Apply to flooded field prior to or at seeding (DOS).
- For application prior to seeding, water must be at a minimum of one-inch deep
- Do not drain fields for a minimum of 30 days after application.

## Zembu

- Occasionally, transient symptoms of chlorosis and slight reduction in vigor may appear on rice, but the crop recovers within a two weeks without any adverse effect on yield.
- To achieve good grass control, consider apply with Cerano at 6 to 8 Ib/A

### Zembu

#### Weeds Controlled

Barnyardgrass California arrowhead Ducksalad Gregg arrowhead Monochoria Redstem Smallflower umbrella sedge Watergrass, early Watergrass, late Water hyssop Weeds suppressed Barnyardgrass Watergrass, early Watergrass, late

- Control of barnyardgrass, early watergrass, and late watergrass if application of ZEMBU Herbicide is made prior to weed emergence and postemergence to the 1-true leaf weed stage.
- Suppression only of barnyardgrass, early watergrass, and late watergrass if application of ZEMBU Herbicide is made at the 2-true leaf weed stage or later.

					IJURY (	WEED CONTROL (%)																
				20	DAT			40 DAT				20 DAT							40 [	DAT		
HERBICIDE PROGRAM	RATE/ACRE	TIMING	BLEACHING	CHLOROSIS	STUNTING	STAND REDUCTION	BLEACHING	CHLOROSIS	STUNTING	STAND REDUCTION	WATERGRASSES	SPRANGLETOP	RICEFIELD BULRUSH	<b>SMALLFLOWER</b>	DUCKSALAD	REDSTEM	WATERGRASSES	<b>SPRANGLETOP</b>	RICEFIELD BULRUSH	<b>SMALLFLOWER</b>	DUCKSALAD	REDSTEM
Zembu	14.9 lb	DOS	3	7	22	27	0	7	18	13	97	100	100	100	100	100	96	100	71	100	100	100
Zembu	14.9 lb	DOS	•	•	12	10		-	47	-	07	100	100	100	100	100	00	100	04	100	100	100
SuperWham! + COC	6 qt + 2.5% v/v	Mid-Tiller	U	U	12	10	U	3	17	5	97	100	100	100	100	100	90	100	94	100	100	100
Zembu	14.9 lb	DOS																				
Butte	7.5 lb	1.5 LSR	3	13	40	32	0	5	17	12	95	100	100	100	100	100	95	100	93	100	100	100
SuperWham! + COC	6 qt + 2.5% v/v	Mid-Tiller																				
Zembu	14.9 lb	DOS																				
Bolero UltraMax	23.3 lb	1.5 LSR	5	0	20	17	0	5	18	17	98	100	100	100	100	100	97	90	100	100	100	100
SuperWham! + COC	6 qt + 2.5% v/v	Mid-Tiller																				

Treatments	Rate	Timing	Yield (lbs/ac)
Zembu	14.9 lbs./ac	DOS	7,527ª
Zembu	14.9 lbs./ac	DOS	0 120a
SuperWham CA! +	6 qt./ac	Mid-Tiller	8,138"
Zembu	14.9 lbs./ac	DOS	
Butte	7.5 lbs./ac	1.5 LSR	8,592
SuperWham CA!	6 qt./ac	Mid-Tiller	
Zembu	14.9 lbs./ac	DOS	
Cerano	6 lbs./ac	DOS	8,352ª
SuperWham CA!	6 qt./ac	Mid-Tiller	
Zembu	14.9 lbs./ac	DOS	
Bolero UltraMax	23.3 lbs./ac	1.5 LSR	6,840 <sup>a</sup>
SuperWham CA	6 qt./ac	Mid-Tiller	
Zembu	14.9 lbs./ac	DOS	
Regiment CA +	8 oz./ac + 5floz./ac	Early-Tiller	7,495ª
SuperWham CA!	6 qt./ac	Mid-Tiller	
Zembu	14.9 lbs./ac	DOS	
Granite GR	15 lbs./ac	3 LSR	7,596ª
SuperWham CA!	6 qt./ac	Mid-Tiller	
Zembu	14.9 lbs./ac	DOS	
Loyant + MSO	21.9 floz/ac +	Early-Tiller	8,141ª
SuperWham CA!	6 qt./ac	Mid-Tiller	
NAI-1891(3.3%	8.1 lbs./ac	DOS	
ai)	8 oz./ac + 5floz./ac	Early-Tiller	0.079a
Regiment CA +	6 qt./ac	Mid-Tiller	9,078"
SuperWham CA!			
Untreated Control	-	-	3,054 <sup>b</sup>



Non-treated control

Zembu alone



Zembu program

### Prowl H2O (pendimethalin) herbicide optimization in water seeded rice

- Efficacy of pendimethalin in herbicide mixtures applied postemergence at different rates
- Efficacy of pendimethalin as an overlay post-emergence residual application for season-long weed control
- Rice response to pendimethalin herbicide mixture applications at 3and 5-leaf stage
- Prowl  $H_2O$  applied after a Leathers' method and pinpoint application in herbicide mixtures

# Herbicide Resistance

#### Herbicide Resistance

	Date of collection:
Submittee Information:	Field/Site Information: GP5Coordinates
Grower Information:	Percentage official that is suspected to be resistant. 5% When was the resistance suspected in this fields 2013
Herbicides   Resistance     used   B     B   B <td>Please draw a brief map of field with location of sampling</td>	Please draw a brief map of field with location of sampling
Regiment CA	How many plants were sampled? 30 acress         Water Management         Surveq(x) of Water         Image Pump         Continuous Read         David         Image Device         Image Device

#### HERBICIDE RESISTANCE TESTING FORM RFBR-10-04

Bring the sample and form to Sour long (JCCP, Pare Advisor or drop off samples at the address index preferably of the end of September. Rive Experiment Septem 1 955 Butte, City (Hot (162) IPO Box 306 I Bitgs: CA 95917

Weed Species					Herbicid	es						
	Bolero	Butte	Cerano	Clincher	Grandstand	Granite SC	Propanil	Regiment	Loyant			
				Number	r of resistant s	amples						
Barnyardgrass [25]	3	4	2	5			0	0	5			
Early watergrass [4]	1	0	0	1			3	3	1			
Late watergrass [5]	1	2	1	1			2	2	2			
Bearded Sprangletop [18]	1	3	1	4					7			
Smallflower Umbrella Sedge [16]	2	1			1	4	7	5	0			
Redstem [1]					1	0	1	1				



#### General Principles of Herbicide Resistance Management

- Apply integrated weed management practices. Use multiple herbicide sites-of-action with overlapping weed spectrums in rotation, sequences, or mixtures.
- Use the full recommended herbicide rate and proper application timing for the hardest to control weed species present in the field.
- Scout fields after herbicide application to ensure control has been achieved. Avoid allowing weeds to reproduce by seed or to proliferate vegetatively.
   Monitor site and clean equipment between sites.
- When resistance to an herbicide develops there may be resistance to all herbicides with the similar mode of action.

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