Weed Control Potential of Florpyrauxifen-benzyl, a New Rice Herbicide

Saul Estrada, Aaron Becerra-Alvarez, Alexander Ceseski, and Kassim Al-Khatib.
Plant Science Department, University of California, Davis, CA, USA

UCDAVIS
DEPARTMENT OF PLANT SCIENCES

Introduction

- California rice (*Oryza sativa* L.) growers are challenged with managing weeds with a limited number of herbicides.
- Herbicide resistance is widespread in California rice systems because there is not much variation in modes of action between the few herbicides available.
- Florpyrauxifen-benzyl is the active ingredient for a new synthetic auxin herbicide (Loyant®). It is a postemergence herbicide with broad spectrum control. Effective control of grass, sedge, and broadleaf weeds has been reported.
- Loyant® provides a new tool to combat tough weeds that have developed resistance to other herbicides such as weeds resistant to ALS inhibitors and ACCase inhibitors.
- Loyant® is currently registered for use in some states in the south and midwest, but is in the process of being registered in California for rice growers.

Objective: To determine weed control efficacy and rice injury of Loyant® when incorporated with different herbicide programs in the California water-seeded system.

Materials and Methods

- A randomized complete block design field experiment was implemented with four replications in the 2020 growing season.
- Plot size: 10 ft x 20 ft
- Study was conducted at the Rice Experiment Station in Biggs, CA.
- M206 rice variety was seeded by plane at a rate of 120 lbs/ac on May 28, 2020.
- Three base pre-emergent herbicides; Cerano®, Bolero® UltraMax, and Butte® were applied at day of seeding (DOS). Herbicide programs with Loyant® were sprayed at a rate of 0.036 lbs ai/ac which was applied when watergrass weeds reached four to five leaf stage (LS WG). Herbicide programs with experimental formulations of florpyrauxifen-benzyl; GF-3479 and GF-3565, were applied at rates of 0.307 lbs ai/ac and 0.072 lbs ai/ac respectively. (Respective timing and rates of partner herbicide programs displayed in table 1).
  - Note: SuperWham CA® was applied before rice reached full-tiller stage. Applied 18 DAS.
- Weed control was assessed with visual percent control ratings at 0, 14, 28, and 42 days after treatment (DAT). Rice injury evaluations with visual percent ratings were completed at 7, 14, 21, and 28 DAT. Rice stand reduction visual percent ratings were conducted at 21 DAT. Rice was harvested on October 21st and rice grain yield at 14% moisture was determined.
- Data was analyzed with ANOVA and LSD (p=0.05).


Figure 1: UTC plots not harvested due to excess tall watergrasses and minimal rice. Assigned a yield of 0 lbs/ac.

Results

Table 1: Loyant CA in Tank-mix and Pre-mix in Herbicide Program for Broad-Spectrum Weed Control, Rice Injury, and Rice Grain Yield

				Weed Control % (42 DAT)						
	Treatments	Rate/Acre	Timing	Watergrass	Sprangletop	Ricefield Bulrush	Smallflower Sedge	Ducksalad	%Stand Reduction 21 DAT	Yield (Lbs/ac)
	Untreated Control (UTC)	-	-	0^{c}	0^{d}	0^{c}	0^{c}	0^{d}	0^{c}	0^{d}
1	Cerano® Loyant® + MSO SuperWham CA®+COC	12 lbs 0.036 lbs ai + 0.31% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	90^{a}	89.5^{ab}	96.5^{a}	95.8^{a}	96.5^{ab}	0^{c}	6058.5^{a}
2	Cerano® Loyant® + Clincher® CA COC SuperWham CA®+COC	12 lbs 0.036 lbs ai + 15 floz + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	94^{a}	89.0^{ab}	97.3^{a}	88.8^{a}	79.8^{bc}	0^{c}	5467.4^{a}
3	Cerano® Loyant® + Granite® SC COC SuperWham CA®+COC	12 lbs 0.036 lbs ai + 2.8 floz + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	98^{a}	94^{ab}	98^{a}	98^{a}	98^{a}	0^{c}	6970.5^{a}
4	Cerano® GF-3479 + COC SuperWham CA®+COC	12 lbs 0.307 lbs ai + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	94.5^{a}	96^{a}	98^{a}	98^{a}	96^{ab}	0^{c}	6921.9^{a}
5	Cerano® GF-3565 + COC SuperWham CA®+COC	12 lbs 0.072 lbs ai + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	96.5^{a}	97.3^{a}	97.3^{a}	97.3^{a}	97.3^{a}	0^{c}	7297.5^{a}
6	Cerano® Regiment® + UAN 32% Dyne-Amic SuperWham CA®+COC	12 lbs 0.67 oz + 2 % v/v 0.25 % v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	80.3^{ab}	92^{ab}	93.3^{a}	87.5^{ab}	85.3^{abc}	1.7^{c}	1730.5^{ab}
7	Bolero® UltraMax Loyant® + MSO SuperWham CA®+COC	23 lbs 0.036 lbs ai + 0.31% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	81^{ab}	93.5^{ab}	97.3^{a}	97.3^{a}	97.3^{a}	34.5^{ab}	602.3 ^{bc}
8	Bolero® UltraMax Loyant® + Clincher® CA COC SuperWham CA®+COC	23 lbs 0.036 lbs ai + 15 floz + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	79.8^{ab}	89^{ab}	97.3^{a}	97.3^{a}	98^{a}	31.6^{ab}	594.2^{bc}
9	Bolero® UltraMax Loyant® + Granite® SC COC SuperWham CA®+COC	23 lbs 0.036 lbs ai + 2.8 floz + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	97.3^{a}	97.3^{a}	97.3^{a}	97.3^{a}	97.3^{a}	72.3^{a}	4541.8^{ab}
10	Bolero® UltraMax GF-3479 + COC SuperWham CA®+COC	23 lbs 0.307 lbs ai + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	89.8^{a}	89^{ab}	97.3^{a}	97.3^{a}	97.3^{a}	15.1^{b}	4444.3^{ab}
11	Bolero® UltraMax GF-3565 + COC SuperWham CA®+COC	23 lbs 0.072 lbs ai + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	96.5 ^{a}	96.5^{a}	96.5^{a}	96.5^{a}	96.5^{ab}	27.6^{ab}	4664.5^{ab}
12	Bolero® UltraMax Regiment® + UAN 32% Dyne-Amic SuperWham CA®+COC	23 lbs 0.67 oz + 2 % v/v 0.25 % v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	67.5^{b}	83.8^{abc}	96.5^{a}	96.5^{a}	97.3^{a}	19.9^{ab}	94.2^{c}
13	Butte® Loyant® + MSO SuperWham CA®+COC	7.5 lbs 0.036 lbs ai + 0.31% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	95.3^{a}	94.8^{a}	97.3^{a}	97.3^{a}	97.3^{a}	0^{c}	7289.4^{a}
14	Butte® Loyant® + Clincher® CA COC SuperWham CA®+COC	7.5 lbs 0.036 lbs ai + 15 floz + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	97.3^{a}	74.5 ^{bc}	97.3^{a}	97.3^{a}	97.3^{a}	0^{c}	6901.5^{a}
15	Butte® Loyant® + Granite® SC COC SuperWham CA®+COC	7.5 lbs 0.036 lbs ai + 2.8 floz + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	96.5^{a}	94.3^{ab}	97.3^{a}	97.3^{a}	97.3^{a}	0^{c}	7402.2^{a}
16	Butte® GF-3479 + COC SuperWham CA®+COC	7.5 lbs 0.307 lbs ai + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	94.8^{a}	91.5^{ab}	97.3^{a}	97.3^{a}	97.3^{a}	0^{c}	7561.7^{a}
17	Butte® GF-3565 + COC SuperWham CA®+COC	7.5 lbs 0.072 lbs ai + 2.5% v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	96.3^{a}	95^{a}	96.5^{a}	96.5^{a}	96.5^{ab}	0^{c}	6950.3^{a}
18	Butte® Regiment® + UAN 32% Dyne-Amic SuperWham CA®+COC	7.5 lbs 0.67 oz + 2 % v/v 0.25 % v/v 6 qt + 1 qt	DOS 4-5 LS WG Full-Tiller	57.5^{b}	62.5^{c}	72^{b}	72^{b}	72^{c}	0^{c}	2579.7^{ab}

Discussion

- Control of watergrass species (*Echinochloa spp.)* with treatments that had Loyant®, GF-3479, or GF-3565 averaged between 90-98% except for treatments 7 and 8 which had less control (Table 1).
  - Treatments 6, 12, and 18 which did not have florpyrauxifen-benzyl formulations had on average 15%, 21%, and 39% less watergrass control respectively (Table 1).
- Bearded sprangletop (*Leptochloa fascicularis*) was controlled by all herbicide programs.(Table 1). Important to note that Loyant® itself does not control sprangletop and needs partner herbicides to successfully manage it.
- Ricefield bulrush (*Schoenoplectus mucronatus*), smallflower sedge (*Cyperus difformis*), ducksalad (*Heteranthera limosa)*, and water hyssop (*Bacopa aquatica)* were controlled with herbicide programs containing Loyant®, GF-3479, or GF-3565. Averaged 97% control except for ducksalad, treatment 2, which had 17% less control (Table 1; water hyssop data not shown).
- Treatments 6,12, and 18 had significantly lower yields within the respective Cerano®, Bolero® UltraMax, and Butte® treatment groups. Yields were on average 4813 lbs/ac, 2875 lbs/ac, and 4641 lbs/ac lower respectively.
- Rice recovered from bleaching and stunting in herbicide programs with Cerano® and Bolero® UltraMax by 28 days after treatment (Data not show).
  - Herbicide programs with Bolero® UltraMax on average had 34% more rice stand reduction at 21 days after treatment (figures 2 and 3). Stand reduction persisted until harvest. Yields on average were significantly lower than partner herbicides containing Cerano® or Butte® .

Figure 2. Treatment 5 (60 DAS)

Figure 3. Treatment 10 (60 DAS)

Conclusions

- Loyant® and other formulations of florpyrauxifen-benzyl demonstrated to be an effective weed management tool in California water-seeded rice when implemented with herbicide programs containing pre-emergent applications.
- Acceptable yields were recorded with Loyant® herbicide programs.
- Integrated pest management practices will be needed to prevent Loyant® from developing herbicide resistance.

Acknowledgments

- California Rice Research Board
- Rice Experiment Station
- CORTEVA™ agriscience