Rice Response and Weed Control from Clomazone Applied at Different Timing in a Continuous Flood System

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Introduction

- California rice (*Oryza sativa* L.) is grown in a continuous flood system. This has led to few adapted, competitive grass and sedge weeds. Such as watergrass species (*Echinochloa* spp.) and sprangletop (*Leptochloa fusca)*. Grass emergence can occur early or later in the season.
- Clomazone as a microencapsulated granule (Cerano®) is used to control sprangletop applied at day of seeding (DOS). Some growers applied clomazone after leathering (early drain and then re-flood after the crop has established shallow roots). However, this also gives weeds the opportunity to become highly competitive. Cerano® label has a DOS timing with a 14-day water holding period.

Objective

The objective of this research was to evaluate rice and weed response to Cerano® applied at DOS, and after early drain (leathering).

Materials and Methods

- The study was conducted in 2019 and 2020 at the Rice Experiment Station in Biggs, CA as a RCBD for each water management method "Figure 1." A 120 lb ac^{-1} seeding rate was used.
- Cerano® was applied at 0.4 lb ai ac^{-1}, 0.5 lb ai ac^{-1} and 0.6 lb ai ac^{-1} at DOS and after leathering. Table 1 shows the planting and application dates.
- Visual percent ratings on bleaching and stand reduction for rice injury and weed control were conducted at 14, 28, 40 and 60 days after treatment (DAT). Yield was determined at 14% moisture. Data was analyzed using ANOVA and LSD (α=0.05)

Table 1 Planting and Application Dates

	2019					2020				
Planting Dates	June 13					May 28				
	Day of Seeding		Leathering			Day of Seeding		Leathering		
Clomazone Application Dates	June 13		June 19			May 28		June 4		
Additional herbicides applied later in the season for sedge and broadleaf control	Penoxsulam (Granite GR®)		13 lb ac^{-1}	23 DAS		Penoxsulam (Granite GR®)		13 lb ac^{-1}	25 DAS	
	Propanil (SuperWham CA®)		4 qt ac^{-1}	38 DAS		Propanil (SuperWham CA®)		4 qt ac^{-1}	30 DAS	
	Triclopyr (Grandstand CA®)		1 pt ac^{-1}	38 DAS		Triclopyr (Grandstand CA®)		1 pt ac^{-1}	30 DAS	

Figure 1. On the left a 4-5 inch continuous flood with DOS application. On the right is leathering method. Plots were drained 3 (2019) and 4 (2020) days after seeding.

Table 2 Weed Control of *Echinochloa* spp. and *Leptochloa fusca* from Clomazone Applied at Three Rates at Day of Seeding and After an Early Drain in a Continuous Flood for 2019 and 2020

	2019						2020					
	Echinochloa spp.			*Leptochloa fusca*			*Echinochloa* spp.			*Leptochloa fusca*		
Treatment	14 DAT	40 DAT	60 DAT	28 DAT	40 DAT	60 DAT	14 DAT	40 DAT	60 DAT	28 DAT	40 DAT	60 DAT
Day of Seeding												
Clomazone 0.4 lb ai ac^{-1}	81	100	100	100	100	100	71	36	54	93	93	95
Clomazone 0.5 lb ai ac^{-1}	90	100	100	100	100	100	81	69	69	91	93	97
Clomazone 0.6 lb ai ac^{-1}	86	100	100	100	100	100	81	70	71	95	95	92
Untreated	0	0	0	0	0	0	0	0	0	0	0	0
Leathering												
Clomazone 0.4 lb ai ac^{-1}	63	100	100	100	100	100	40	25	21	70	80	71
Clomazone 0.5 lb ai ac^{-1}	81	100	100	99	100	99	50	30	24	76	85	71
Clomazone 0.6 lb ai ac^{-1}	95	100	100	100	100	100	49	33	24	75	86	70
Untreated	0	0	0	0	0	0	0	0	0	0	0	0
LSD α=0.05	23.92	-	-	1.30	0.26	0.26	17.89	6.23-17.49	11.89	10.05	8.94	9.06

Table 3 Rice Injury and Yield for Clomazone Applied at Three Rates at Day of Seeding and After Leathering in a Continuous Flood

	2019		2020		Combined Years
Treatment	Bleaching 14 DAT	Stand Reduction	Bleaching 14 DAT	Stand Reduction	Yield lb ac^{-1}
Day of Seeding					
Clomazone 0.4 lb ai ac^{-1}	15	4	26	5	5096
Clomazone 0.5 lb ai ac^{-1}	41	14	43	10	5270
Clomazone 0.6 lb ai ac^{-1}	66	5	66	14	5377
Untreated	0	0	0	0	2335
Leathering					
Clomazone 0.4 lb ai ac^{-1}	66	53	58	35	3615
Clomazone 0.5 lb ai ac^{-1}	54	45	60	30	3680
Clomazone 0.6 lb ai ac^{-1}	95	81	73	51	3065
Untreated	0	0	0	0	2231
LSD (α=0.05)	23.05	16.52	29.45	21.10	1004.66

Figure 2. Clomazone causes bleaching on grass weeds and rice. Application after leathering caused greater rice injury, more bleaching was observed as shown at right.

Results and Discussion

- Weed pressure was variable each year. In 2019, on average, control over both grass species was 99-100%. In 2020 the DOS application at 60 DAT on average had 33-47% greater control over *Echinochloa* spp. and 20-24% greater control over *Leptochloa fusca* (Table 2).
- Rice injury was similar for both years. On average 29-39% more bleaching was observed in 2019, and 7-32% more bleaching in 2020, for leathering at 14 DAT. Most rice will recover from the bleaching later in the season. On average greater stand loss was observed after leathering. Yield was on average 2205 lb ac^{-1} greater for the DOS applications (Table 3).
- Draining early caused more weed pressure and clomazone application in shallow flood decreased control the second year and increased injury on rice.

Conclusion

- Using a complete continuous flood all season resulted in greater grass control and yield. Clomazone use after leathering resulted in higher rice injury.
- The leathering method may be useful with other herbicides if rice injury is acceptable.

Acknowledgments

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