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Efficacy of Pyrazosulfuron-ethyl Against Weeds in Rice Nursery Under Mid Hill Conditions of Himachal Pradesh

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ABSTRACT

Broadcast application of pyrazosulfuron-ethyl at 15 g ha^{-1} mixed with sand at 150 kg ha^{-1} was effective to control weeds in rice nursery and resulted in significantly lower weed density, weed dry weight and higher rice seedlings biomass without any phytotoxic effect on rice seedlings.

INTRODUCTION

Rice crop is grown as transplanted crop on large scale for which healthy seedlings play a vital role in increasing the productivity. Weeds are the major constraints in raising healthy nursery of rice. Because of similar morphological characteristics of *Echinochloa* spp. and rice plants at the initial stage, some of the weeds from nursery beds are also transplanted in the main field alongwith the rice plants thus causing considerable reduction in its productivity. Butachlor, anilofos, pendimethalin and pretilachlor are being used as pre-emergence herbicides for effective control of grass weeds. But continuous application of the same herbicide with same mode of action may develop resistance in weed species. Therefore, the present study was undertaken to evaluate the performance of a new post-emergence herbicide pyrazosulfuron-ethyl to control weeds in rice nursery and its effect on rice seedlings under mid hill conditions of Himachal Pradesh.

MATERIALS AND METHODS

A field experiment was conducted at the Research Farm of Department of Agronomy, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur during **kharif** seasons of 2001 and 2002. The soil of the experimental field was silty clay loam in texture having pH 5.8, medium in available N (332 kg ha^{-1}) and P_2O_5 (18 kg ha^{-1}) and high in K_2O (332 kg ha^{-1}). The experiment was laid out in a randomized block design with 12 treatments and three replications. Treatments comprised pyrazosulfuron (10 WP) at 10 and 15 g ha^{-1} as spray and broadcast application after mixing with sand (150 kg ha^{-1}), pyrazosulfuron at 20 g ha^{-1} spray, oxadiargyl (80 WP) at 10 g ha^{-1}, pendimethalin at 1.25 kg ha^{-1}, anilofos at 0.6 kg ha^{-1}, butachlor at 1.5 kg ha^{-1}, pretilachlor at 0.75 kg ha^{-1}+safener, farmer's practice (hand weeding) and unweeded check. Rice variety RP 2421 was sown on June 5, 2001 and May 28, 2002 in rows on well prepared raised seed beds as per package of practices of CSK HPKV, Palampur. Herbicides were applied immediately after sowing (1AS) as per the treatments. Irrigations were applied as and when required to keep soil saturated. The rice nursery was uprooted at 30 days after sowing (DAS) of seeds and crop biomass of oven-dried samples was recorded.

RESULTS AND DISCUSSION

The experimental field was infested with *Echinochloa colona, Echinochloa crusgalli, Cyperus iria, Panicum dichotomiflorum, Commelina communis* and *Aeschymomene indica.* However, *A. indica* was present during 2002 only. The density of all the weed species was drastically reduced by all the treatments over unweeded check

Table 1. Effect of treatments on species-wise weed count in rice nursery

Treatment	Dose (g ha^{-1})	Application method	Weed count (No. m^{-2})								
			E. spp.		*C. iria*		*P. dichotomiflorum*		*C. communis*		*A. indica*
			2001	2002	2001	2002	2001	2002	2001	2002	2002
Pyrazosulfuron-ethyl	10	Sand mix	8.7	7.4	9.6	1.0	4.6	8.8	8.0	5.6	5.6
			(74)	(53)	(90)	(0)	(21)	(80)	(64)	(32)	(32)
Pyrazosulfuron-ethyl	15	Sand mix	7.5	6.2	6.6	1.0	5.6	6.2	5.0	5.2	5.2
			(53)	(48)	(42)	(0)	(32)	(37)	(32)	(26)	(26)
Pyrazosulfuron-ethyl	10	Spray	10.6	10.3	7.3	1.0	8.9	7.3	7.2	5.6	5.6
			(112)	(105)	(52)	(0)	(80)	(53)	(64)	(32)	(32)
Pyrazosulfuron-ethyl	15	Spray	8.8	10.8	5.6	1.0	8.3	10.6	6.9	4.3	5.6
			(80)	(117)	(32)	(0)	(69)	(112)	(48)	(22)	(32)
Pyrazosulfuron-ethyl	20	Spray	7.3	10.8	4.7	1.0	5.6	8.3	6.5	6.8	6.8
			(53)	(117)	(21)	(0)	(32)	(69)	(42)	(48)	(48)
Oxadiargyl	10	Spray	9.8	7.3	12.8	1.0	6.9	6.4	7.6	2.6	1.0
			(96)	(53)	(167)	(0)	(48)	(42)	(58)	(10)	(0)
Pendimethalin	1000	Spray	4.7	5.6	5.9	6.6	4.7	4.6	10.2	4.1	4.1
			(21)	(32)	(37)	(37)	(21)	(21)	(106)	(16)	(16)
Anilofos	600	Spray	12.0	4.6	11.2	1.0	6.9	6.4	6.1	4.1	4.1
			(144)	(21)	(128)	(0)	(48)	(42)	(37)	(16)	(16)
Butachlor	1500	Spray	8.0	7.6	5.9	3.1	4.1	1.0	5.6	6.1	6.1
			(64)	(58)	(37)	(10)	(16)	(0)	(32)	(37)	(37)
Pretilachlor+safener	750	Spray	8.9	5.6	8.3	2.0	4.7	6.5	7.6	7.6	7.6
			(80)	(32)	(69)	(5)	(21)	(42)	(58)	(58)	(58)
Hand weeding 15 DAS	-	-	10.7	10.1	11.3	5.6	5.6	7.3	2.1	7.2	7.2
			(117)	(101)	(128)	(32)	(32)	(53)	(6)	(53)	(53)
Weedy	-	-	15.6	13.5	14.4	6.1	8.4	13.1	5.6	5.6	5.2
			(244)	(181)	(208)	(37)	(69)	(170)	(32)	(32)	(26)
LSD (P=0.05)	-	-	1.52	1.76	2.54	1.58	1.87	2.19	3.33	2.81	2.07

(Table 1). Pyrazosulfuron-ethyl at 15 g ha^{-1} broadcasted after mixing with sand was more effective to reduce the density of *Echinochloa* spp. and *P. dichotomiflorum* as compared to its spray application. But application of pyrazosulfuron-ethyl through spray was more effective to control *C. iria* than its application through sand. Pyrazosulfuron ethyl did not have any effect on *C. communis* and *A. indica*. Pendimethalin at 1.0 kg ha^{-1} resulted in significantly lowest population of *Echinochloa* spp. The next best treatment to control *Echinochloa* spp. was pyrazosulfuron at 10 and 15 g ha^{-1} broadcast after mixing with sand. *P. dichotomiflorum* population was reduced significantly by butachlor at 1.5 kg ha^{-1}. Oxadiargyl at 10 g ha^{-1} resulted in significantly lowest population of *A. indica*.

All the weed control treatments were significantly superior in reducing the total weed count and dry matter of weeds over unweeded check. Pyrazosulfuron-ethyl at 15 g ha^{-1} (sand mix) was found significantly more effective in reducing population and dry matter of weeds except during 2002 when weed dry weight was significantly reduced by pretilachlor which was at par with butachlor and anilofos. However, pyrazosulfuron at all the doses and methods of application being at par with hand weeding and oxadiargyl were the next best treatments. Similar observations on the effect of pyrazosulfuron-ethyl to control *E. crusgalli*, *Saggitaria* spp. and *Rotala indica* in rice nursery were reported by Fajardo

Table 2. Effect of treatments on total weed count, total weed dry weight and crop biomass of rice nursery

Treatment	Dose (g ha^{-1})	Application method	Total weed count (No. m^{-2})		Total weed dry matter (g m^{-2})		Crop biomass (g m^{-2})	
			2001	2002	2001	2002	2001	2002
Pyrazosulfuron-ethyl	10	Sand mix	15.3 (234)	14.0 (197)	31.2	6.7 (44)	123.8	126.7
Pyrazosulfuron-ethyl	15	Sand mix	11.7 (138)	11.6 (133)	19.8	6.8 (45)	122.7	124.6
Pyrazosulfuron-ethyl	10	Spray	18.7 (352)	14.9 (222)	49.7	6.8 (46)	118.6	121.6
Pyrazosulfuron-ethyl	15	Spray	16.1 (261)	17.1 (293)	37.2	6.7 (44)	112.0	117.1
Pyrazosulfuron-ethyl	20	Spray	14.3 (208)	16.8 (282)	23.1	6.3 (39)	124.0	125.1
Oxadiargyl	10	Spray	19.7 (389)	10.3 (106)	45.9	5.7 (32)	109.4	112.0
Pendimethalin	1000	Spray	12.8 (165)	11.1 (122)	23.2	7.3 (53)	126.1	128.8
Anilofos	600	Spray	19.4 (378)	9.8 (96)	29.8	5.6 (24)	121.1	121.1
Butachlor	1500	Spray	12.6 (160)	11.9 (144)	19.6	4.5 (19)	131.8	139.2
Pretilachlor+safener	750	Spray	14.1 (202)	14.0 (197)	22.2	4.1 (16)	126.3	128.5
Hand weeding 15 DAS	-	-	17.6 (314)	17.1 (293)	22.6	6.2 (38)	129.8	138.1
Weedy	-	-	23.0 (533)	18.1 (302)	62.6	10.5 (110)	98.2	99.7
LSD (P=0.05)	-	-	2.54	4.40	3.4	1.41	13.81	14.87

et al. (1990). Whereas Purushothaman and Ilangovan (1994) reported that pyrazosulfuron in combination with butachlor or thiobencarb gave broad spectrum weed control in wet seeded rice.

Broadcast application of pyrazosulfuron-ethyl at 10 g ha^{-1} or 15 g ha^{-1}+sand being statistically at par with butachlor at 1.5 kg, pretilachlor at 0.75 kg ha^{-1}, pyrazosulfuron at 20 g ha^{-1} spray, pendimethalin at 1.00 kg ha^{-1}, anilofos 0.6 kg ha^{-1} and hand weeding resulted in significantly higher crop biomass (Table 2). However, dry weight of crop biomass was significantly higher in all the treatments over unweeded check.

Broadcast application of pyrazosulfuron at 15 g ha^{-1} or 10 g ha^{-1} with sand and spray application at 20 g ha^{-1} were as effective as pendimethalin at 1.0 kg ha^{-1}, butachlor at 1.5 kg ha^{-1}, anilofos at 0.6 kg ha^{-1} and pretilachlor at 0.75 kg ha^{-1}+safener in controlling weeds in rice nursery without any phytotoxic effect to rice seedlings.

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