

Effect of triasulfuron, triasulfuron + pretilachlor and bensulfuron-methyl on nutrients uptake by crop and weeds in transplanted rice

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Yield reduction in transplanted rice has been reported from 28 to 45% due to uncontrolled weeds (Singh *et al.* 2003). Weed competition is one of the most important factors in limiting yield of rice. Among the different weed species, grassy weeds pose greater infestation. These have an extensive and fibrous root system. Similarly, sedges grow huge in number and cause serious competition for nutrients *etc.* The roots of sedges also dominate the surface feeding zone and obstruct nutrient flow to crop roots. Broad leaf weeds being deep rooted explore the sub-surface zone for minerals and exert less competition for nutrients with rice (Raju and Reddy 1986).

To find out the nutrient removal by weeds and crop, a field experiment was carried out with 12 weed control treatments in a randomized block design with four replications at Crop Research Center, G. B. Pant University of Agriculture & Technology, Pantnagar during *khari* season of 2005. The rice variety 'Jaya' was sown in the nursery on June 2 and transplanting was done on June 26 at 20×20 cm spacing with 2-3 seedling per hill, respectively. The crop was fertilized with recommended dose of fertilizer as 120 kg N, 60 kg P₂O₅ and 50 kg K₂O/ha. The soil of experimental plot was classified as Aquic Hapludoll and silt loam in texture. The soil was rich in organic carbon (0.94 %), medium in available phosphorus (24 kg P/ha) and potassium (198 kg K/ha). An exhaust crop of wheat was taken during *rabi* season every year. For the control of *khaira* (Zn deficiency), two sprays of 0.5% zinc sulphate were done at 15 and 25 days after transplanting. There was slight incidence of stem borer which was controlled by applying carptap hydro chloride-4 G 20 kg/ha. Observations on weed density and dry weight were taken at 90 days after transplanting by placing a quadrat of 1×1 m randomly at two places in each plot which were transformed by $\sqrt{x+1}$ statistical analysis. Grain yield was expressed at 14% moisture.

The highest loss of nutrients (42 N, 10 P and 21.8 K kg/ha) was observed in non-weeded control due to more density and dry weight of weeds. Among the herbicidal treatments, the lowest nitrogen and potassium uptake was found with butachlor at 1.5 kg/ha + one hand weeding which was statistically at par with trisulfuron + pretilachlor at 0.009 + 0.5 kg/ha, butachlor at 1.5 kg/ha, pretilachlor at 0.75 kg/ha and two hand weeding. The lowest phosphorus uptake by weeds was also recorded with

butachlor at 1.5 kg/ha + one hand weeding which was at par with trisulfuron + pretilachlor at 0.009 + 0.5 kg/ha and two hand weeding. The nutrient uptake by weeds is directly related with weed population and dry matter of weeds and inversely related to rice grain yield (Raju and Reddy 1986).

The highest nutrient removal by rice crop was recorded with weed free treatment. (Table 2). Among the herbicidal treatments the highest nitrogen uptake by rice crop was recorded with triasulfuron + pretilachlor at 0.009 + 0.5 kg/ha which was at par with butachlor at 1.5 kg/ha, pretilachlor at 0.75 kg/ha, butachlor at 1.5 kg/ha + one hand weeding and two hand weeding. Similarly, the highest phosphorus removal by rice crop was found with butachlor at 1.5 kg/ha which was statistically at par with pretilachlor at 0.75 kg/ha, triasulfuron + pretilachlor at 0.009 + 0.5 kg/ha, butachlor at 1.5 kg/ha + one hand weeding and two hand weeding. Potassium removal by rice crop was maximum with butachlor at 1.5 kg/ha among the herbicidal treatments which was significantly superior to trisulfuron at 0.009 kg/ha applied at 6 days after transplanting and non-weeded control. All weeds control treatments produced significantly higher grain yield over non-weeded control (Table 1). The highest grain yield (6 t/ha) was recorded in weed free treatment, which was significantly higher than all the weed control treatments except two hand weeding (5.8 t/ha), butachlor at 1.5 kg/ha + one hand weeding (5.5 t/ha), butachlor at 1.5 kg/ha (5.4 t/ha), trisulfuron + pretilachlor at 0.009 + 0.5 kg/ha (5.3 t/ha) and pretilachlor at 0.75 kg/ha (5.3 t/ha). The lowest grain yield (3.4 t/ha) was recorded in non-weeded control. Among the herbicidal treatments, the lowest dry weight of weeds was recorded with butachlor at 1.5 kg/ha + one hand weeding which was at par with two hand weeding. This study indicated that the combination of trisulfuron + pretilachlor at 0.009 + 0.5 kg/ha was as good as butachlor at 1.5 kg/ha and pretilachlor at 0.75 kg/ha, the recommended conventional herbicides.

REFERENCES

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Table 1. Grain yield, dry weight of weeds and nutrient removal by weeds as influenced by different weed control treatments

Treatments	Grain yield (t/ha)	Straw yield (t/ha)	Dry weight of weeds (g/m ²)	Nutrient removal by weeds (kg/ha)					
				Nitrogen		Phosphorous		Potassium	
Butachlor 1.5 kg/ha at 3 DAT	5.40	6.62	4.72 (113.00)	1.69 (4.46)	0.68 (0.98)	1.40 (3.09)			
Pretilachlor 0.5 kg/ha at 3 DAT	4.70	5.81	5.48 (240.57)	2.50 (11.21)	1.26 (2.64)	2.10 (7.34)			
Pretilachlor 0.75 kg/ha at 3 DAT	5.27	6.53	4.73 (116.12)	1.71 (4.61)	0.69 (1.01)	1.42 (3.15)			
Triasulfuron 0.009 kg/ha at 6 DAT	4.86	5.22	5.46 (233.51)	2.49 (11.17)	1.31 (2.71)	2.12 (7.49)			
Triasulfuron 0.009 kg/ha at 13 DAT	4.83	5.98	5.48 (237.81)	2.57 (12.10)	1.32 (2.76)	2.13 (7.60)			
Triasulfuron + pretilachlor 0.009 + 0.5 kg/ha at 6 DAT	5.28	6.47	4.59 (100.52)	1.64 (4.19)	0.60 (0.83)	1.32 (2.82)			
Bensulfuron-methyl 0.05 kg/ha at 23 DAT	4.58	5.84	5.59 (268.02)	2.66 (13.32)	1.42 (3.13)	2.23 (8.43)			
Bensulfuron-methyl 0.06 kg/ha at 23 DAT	4.80	6.47	5.52 (250.74)	2.52 (11.57)	1.35 (2.87)	2.18 (7.90)			
Butachlor 1.5 kg/ha at 3 DAT + 1 HW	5.45	5.94	4.36 (77.35)	1.56 (3.85)	0.49 (0.81)	1.31 (2.76)			
Two hand weeding	5.80	6.41	4.43 (83.22)	1.48 (3.42)	0.55 (0.76)	1.30 (2.67)			
Weed free*	6.02	6.47	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)			
Non-weeded control	3.41	3.89	6.03 (416.69)	4.04 (42.07)	2.46 (10.0)	3.20 (21.80)			
LSD(P= 0.05)	0.93	1.54	0.23	0.16	0.14	0.21			

DAT=Day after transplanting, HW= hand weeding, *= Weeding at 20, 40 and 60 days after transplanting. Original values are given in parentheses.

Table 2. Nutrient removal by crop as influenced by different weed control treatments

Treatments	N removal by crop (kg/ha)			P removal by crop (kg/ha)			K removal by crop (kg/ha)		
	Grain	Straw	Total	Grain	Straw	Total	Grain	Straw	Total
Butachlor 1.5 kg/ha at 3 DAT	64.34	35.75	100.08	20.11	12.71	32.82	15.82	69.09	84.91
Pretilachlor 0.5 kg/ha at 3 DAT	51.68	28.88	80.57	15.86	9.20	25.06	12.32	57.42	69.74
Pretilachlor 0.75 kg/ha at 3 DAT	60.68	25.39	96.32	18.28	11.86	30.14	14.67	59.16	73.83
Triasulfuron 0.009 kg/ha at 6 DAT	50.76	24.90	75.68	13.96	9.12	23.08	13.22	50.99	64.21
Triasulfuron 0.009 kg/ha at 13 DAT	52.86	29.67	82.53	13.30	9.76	23.06	11.52	57.44	68.96
Triasulfuron + pretilachlor 0.009 + 0.5 kg/ha at 6 DAT	70.29	37.58	107.87	19.04	13.10	32.15	15.41	65.77	81.15
Bensulfuron-methyl 0.05 kg/ha at 23 DAT	47.54	30.58	77.83	14.77	9.64	24.41	12.75	55.54	68.29
Bensulfuron-methyl 0.06 kg/ha at 23 DAT	53.26	33.89	87.14	16.06	10.63	26.64	13.61	60.59	74.20
Butachlor 1.5 kg/ha at 3 DAT + 1 HW	67.15	33.46	100.61	17.87	11.52	29.39	16.77	58.46	75.23
Two hand weeding	73.83	43.19	117.02	20.10	12.91	33.01	18.66	63.33	81.99
Weed free*	87.11	45.02	132.12	23.43	13.11	36.54	20.23	68.13	88.36
Non-weeded control	32.33	17.35	49.57	10.19	6.54	16.73	7.89	24.14	32.03
LSD (P=0.05)	13.63	9.96	20.20	3.63	3.43	5.36	3.14	16.27	17.55