



Efficacy of post-emergence herbicides for weed control in transplanted rice

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Transplanted rice is mainly infested by barnyard grass besides some sedges and broad-leaved weeds. Moreover, recommended herbicides are effective against grasses only when used as pre-emergence and if there is ponding of water at least for 48 hours after treatment. With the continuous use of these herbicides, particularly anilofos, problem of sedges and broad-leaf weeds is increasing every year. Due to increasing problem of sedges and lack of availability of water after transplanting, there is an urgent need to have an early post-emergence herbicide, which can provide effective control of complex weed flora. Additionally, continuous use of the same herbicide may lead to change in weed flora and their intensity with respect to time and may also result in evolution of resistance in some weed species. Some herbicides like bispyribac-sodium and azimsulfuron if applied at 15 and 25 DAT are effective for weed control in transplanted rice. Hence, a study was conducted to find out the efficacy of different post-emergence herbicides for weed control in transplanted rice.

The experiment was conducted at the Students' Farm of College of Agriculture, CCS Haryana Agricultural University, Kaul (Kaithal) during *Kharif* 2008. The soil of the experimental field was clay loam in texture and slightly alkaline in reaction. The soil was low in organic carbon, low in available N and medium in available P and high in available K. The experiment consisted of fifteen treatments, *viz.* two doses of post-emergence herbicides, bispyribac-sodium (25 and 30 g/ha) and azimsulfuron (30 and 40 g/ha) with two timings of their application (20 and 25 DAT) and one dose of fenoxaprop-p-ethyl 56.25 g/ha (25 DAT). Four pre-emergence herbicides pretilachlor 750 g/ha, butachlor 1500 g/ha, oxadiargyl 100 g/ha, pyrazosulfuron 20 g/ha along with weedy and weed free checks and were laid out in randomized block design with three replications. Thirty days old seedlings were transplanted on 3rd July, 2008 manually at a spacing of 20 x 15 cm with two seedlings per hill. The crop was raised with recommended fertilizer dose.

The experimental field was dominated by grassy, broad-leaf weeds and sedges, *viz.* *Echinochloa colona*, *Echinochloa crusgalli*, *Ammania baccifera*, *Ludwigia parviflora*, *Lindernia* spp., *Marsilea quadrifolia*, *Cyperus iria* and *Cyperus difformis*.

Application of pretilachlor 750 g/ha (3 DAT), butachlor 1500 g/ha (3 DAT), bispyribac-sodium 25 and 30 g/ha (20 DAT) and pyrazosulfuron 20 g/ha (3 DAT) brought about similar significant reduction in number of grassy weeds. Yadav *et al.* (2008) also reported effectiveness of bispyribac to control grassy weeds and sedges in transplanted rice. Azimsulfuron at all doses did not provide good control of grassy weeds than other herbicides but was significantly better than weedy check.

Pre-emergence herbicides pretilachlor 750 g/ha (3 DAT), butachlor 1500 g/ha (3 DAT) and pyrazosulfuron 20 g/ha (3 DAT) were statistically similar but better than oxadiargyl at 20 DAT in controlling broad-leaf weeds. Azimsulfuron 30 and 40 g/ha (20 DAT) and pyrazosulfuron 20 g/ha (3 DAT) were statistically similar to pretilachlor and butachlor to control the broad-leaved weeds. Azimsulfuron 30 and 40 g/ha (25 DAT), bispyribac-sodium (at all doses), fenoxaprop-p-ethyl, oxadiargyl and pyrazosulfuron were the next good herbicides and better than weedy check. Numbers of sedges were lowest in weed free treatment and highest in weedy check. Pretilachlor 750 g/ha (3 DAT), bispyribac sodium 25 and 30 g/ha (20 DAT), butachlor 1500 g/ha (3 DAT) and pyrazosulfuron 20 g/ha (3 DAT) were significantly at par to weed free to control sedges. Pal *et al.* (2012) also reported good efficacy of pyrazosulfuron at 20 and 25 g/ha applied at 3 DAT. Significantly lowest weed dry weight was recorded with use of pretilachlor at 750 g/ha and it remained statistically at par with butachlor 1500 g/ha, pyrazosulfuron 20 g/ha and also with post-emergence application (20 DAT) of bispyribac-sodium 25 and 30 g/ha. Walia *et al.* (2008) found significantly lower weed dry weight of grassy weeds with the pre-emergence application of pendimethalin 0.75 kg/ha *fb*

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Table 1. Effect of weed control treatments on weed density, weed dry weight and weed control efficiency in transplanted rice

Treatment	Dose (g/ha)	Time of application (DAT)	Weed density (no./m ²)			Weed dry weight (g/m ²)	WCE (%)
			Grassy	Broad-leaf	Sedges		
Bispyribac-sodium	25	20	4.4 (19)	4.2 (27)	4.3(19)	7.7(59.3)	82.1
Bispyribac-sodium	25	25	5.1 (25)	5.8 (34)	5.4(29)	9.0(81.8)	75.3
Bispyribac-sodium	30	20	3.5 (12)	5.0 (25)	3.8(14)	6.5(42.4)	87.2
Bispyribac-sodium	30	25	4.8 (23)	4.4 (19)	5.2(27)	8.8(78.3)	76.3
Azimsulfuron	30	20	6.7 (45)	5.3 (28)	6.1(37)	10.3(105.8)	68.0
Azimsulfuron	30	25	8.1 (65)	4.0 (16)	6.4(40)	12.3 (150.7)	54.4
Azimsulfuron	40	20	6.6 (43)	5.0 (28)	6.0(36)	9.4 (88.7)	73.2
Azimsulfuron	40	25	7.4 (55)	5.0 (28)	6.3(39)	10.6(113.5)	65.7
Pretilachlor	750	3	3.5 (12)	3.9 (15)	3.4(11)	6.0(36.4)	89.0
Butachlor	1500	3	3.8 (14)	4.7 (22)	4.2(17)	6.9(48.5)	85.3
Oxadiargyl	100	3	7.4 (55)	6.3 (40)	5.5(30)	11.5(131.8)	60.0
Pyrazosulfuron	20	3	4.0 (16)	4.5 (20)	4.4(19)	7.6(57.5)	82.6
Fenoxaprop-p-ethyl	56.25	25	5.9 (35)	7.0 (49)	5.8(33)	11.2(125.0)	62.2
Weedy check			13.0 (170)	9.8 (95)	9.1(82)	18.2(330.5)	-
Weed free			0.7 (0)	0.7 (0)	0.7 (0)	0.7(0)	100
LSD (P=0.05)			1.0	1.1	1.0	1.7	-

Values are square root $\sqrt{x + 0.5}$ transformed and actual values are given in parentheses; DAT: Days after transplanting

Table 2. Effect of weed control treatments on yield attributes and yield in transplanted rice

Treatment	Dose (g/ha)	Time of application (DAT)	No. of panicles/m ²	No. of filled grains/panicle	No. of unfilled grains/panicle	1000-grain weight (g)	Grain yield (t/ha)
Bispyribac-sodium	25	20	310	157	14	24.8	6.40
Bispyribac-sodium	25	25	297	152	16	24.6	6.29
Bispyribac-sodium	30	20	324	162	12	24.9	6.55
Bispyribac-sodium	30	25	301	153	15	24.7	6.33
Azimsulfuron	30	20	283	146	18	24.7	6.15
Azimsulfuron	30	25	260	133	24	24.4	5.59
Azimsulfuron	40	20	288	149	17	24.7	6.20
Azimsulfuron	40	25	280	145	19	24.6	6.09
Pretilachlor	750	3	329	164	10	24.9	6.60
Butachlor	1500	3	322	162	13	24.9	6.54
Oxadiargyl	100	3	270	138	22	24.4	5.87
Pyrazosulfuron	20	3	315	160	13	24.8	6.38
Fenoxaprop-p-ethyl	56.2	25	275	142	21	24.5	6.02
Weedy check	-	-	220	120	30	23.8	4.04
Weed free	-	-	330	165	10	25.0	6.64
LSD (P=0.05)	-	-	28	8	4	0.5	0.27

DAT: Days after transplanting

post-emergence application of bispyribac 25 g/ha. Angiras and Kumar (2005) also found that broadcast application of pyrazosulfuron at 15 g/ha mixed with sand at 150 kg/ha resulted in significantly lower weed density and biomass without any phytotoxic effect on rice plants.

Post-emergence application of azimsulfuron was found to be less effective as grass weed population especially *E. crusgalli* and *E. colona* was higher. Yadav *et al.* (2008) reported lower dry weight of broad-leaf weeds under all the treatments of azimsulfuron.

Effective tillers/m², filled grains/panicle, 1000-grain weight and grain yield were influenced significantly by weed control treatments. Weed free treatment resulted in significantly highest yield attributes and yield, though at par with pretilachlor 750 g/ha (3 DAT), butachlor 1500 g/ha (3 DAT), bispyribac-sodium 25 and 30 g/ha (20 DAT) and pyrazosulfuron 20 g/ha (3 DAT) treatments. These treatments were also found equally effective in reducing unfilled grains per panicle. Similar results of bispyribac-sodium were registered by Yadav *et al.* (2009), Nalini *et al.* (2012), Veeraputhiran and Balasubramanian (2013).

Pre-emergence application of butachlor at 1500 g/ha, pretilachlor 750 g/ha, pyrazosulfuron at 20 g/ha or post-emergence herbicide bispyribac-sodium at the rate of 25 g/ha at 20 DAT could be suitable and economical herbicidal weed management option for transplanted rice to achieve higher productivity.

SUMMARY

The experiment was conducted at the Students' Farm of College of Agriculture, CCS Haryana Agricultural University, Kaul (Kaithal) during *Kharif* 2008. The experiment consisted of fifteen treatments in block design with three replications. Thirty days old seedlings were transplanted on 3rd July, 2008 manually at a spacing of 20 x 15 cm with two seedlings per hill. The crop was raised with recommended fertilizer dose. Pre-emergence application of butachlor at 1500 g/ha, pretilachlor 750 g/ha, pyrazosulfuron at 20 g/ha or post-emergence herbicide bispyribac-sodium at the rate of 25 g/ha at 20 DAT could be suitable and economical herbicidal weed management option for transplanted rice to achieve higher productivity.

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