Indian Journal of Agronomy 47 (1) : 67–71 (March 2002)

Performance of acetachlor and anilofos + ethoxysulfuron for weed control in transplanted rice (*Oryza sativa*)

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Received : March 2001

ABSTRACT

A field study was conducted during the rainy seasons of 1999 and 2000 to evaluate the performance of 2 new herbicides, viz. acetachlor and ready mixture of anilofos + ethoxysulfuron , on weed density, weed dry weight, yield and yield attributes of transplanted rice (*Oryza sativa* L.). Acetachlor at 150 g a.i./ha applied 3 days after transplanting (DAT) and ready mixture of anilofos + ethoxysulfuron at 390 g a.i./ha applied 8 DAT proved effective in controlling both types of weeds and these were found at par with butachlor at 1,500 g a.i./ha in controlling the grassy weeds. The plots treated with acetachlor at 150 g a.i./ha applied 3 DAT and anilofos + ethoxysulfuron at 390 g a.i./ha applied 8 DAT produced similar number of tillers/m^2, number of grains/panicle, length of panicle, 1,000-grain weight and grain yield of rice to that of plots kept weed free for whole of season during both the seasons. On an average, these parameters registered 41 and 39% higher yield during 1999 and 40 and 42% in 2000, as compared to weedy check.

Key words : Acetachlor, Anilofos + ethoxysulfuron, Transplanted rice

Transplanted rice crop faces diverse type of weed flora, consisting of grassy, broad-leaved weeds and some sedges. Competition of these weeds brought about reduction in yield of transplanted rice by about 50% (Ananthakumari and Rao, 1993). Several herbicides such as butachlor, anilofos and pretilachlor have been recommended for the control of weeds in transplanted rice which are effective against grassy weeds only. Some herbicides like Almix and 2,4-D controlled only broad-leaved weeds. Thus for the control of mixed weed flora, sequential application is required. The present study was undertaken to evaluate the efficacy of 2 new herbicides, i.e. acetachlor and ready mixture of anilofos + ethoxysulfuron, on both grassy as well as broad-leaved weeds and effects on transplanted rice.

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MATERIALS AND METHODS

Two years field study was conducted during the rainy seasons of 1999 and 2000 at Regional Research Station, CCS HAU, Karnal. The soil was sandy clay-loam, having pH 8.2. It consisted of 0.45% organic carbon, 162 kg available N, 8.24 kg available P_2O_5 and 362 kg available K_2O/ ha, each applied 3 and 8 days after transplanting (DAT), ready mixture of anilofos + ethoxysulfuron at 260, 325, 390 and 780 g a.i./ha , tank mixture of anilofos + almix at 200+4 each applied 8 days after transplanting, butachlor at 1,500 g a.i./ha applied 3 DAT, were compared with weedy and weed-free check in randomized block design with 3 replications.

Two seedlings / hill of rice cv. 'HKR 46' were transplanted on 2 July 1999 and 12 July 2000 in standing water at a distance of 20 cm x 15 cm. The crop was raised according to the package and practices of the region by using fertilizer dose of 150 kg N/ha, 60 kg P_2O_5/ha and 25 kg $ZNSO_4$/ha and irrigation was applied as and when required. Herbicides were applied as per treatments with the help of knapsack sprayer by using 650 litres water/ha and standing water was maintained up to 7 days after application of herbicides. The crop was harvested during the second week of October. Visual phytotoxicity was taken at 15 days after application of herbicides on 0-10 scale, where 0 means no phytotoxicity and 10 means complete killing of plants. Density and dry weight of grassy and broad-leaved weeds was recorded separately, by taking the samples with the help of random quadrate and dried in oven at 70° C till constant weight was achieved.

RESULTS AND DISCUSSION

The field was dominated by grassy weeds (*Echinochloa colonum* Link. and *E. crus-galli*) Beauv. and other broad-leaved weeds such as *Lindernia* sp., *Ludwigia* sp. and *Eclipta alba* (L.) Hassk. were present in low density. All the herbicide treatments significantly reduced the density and dry weight of grassy and broad-leaved weeds, whereas butachlor reduced the density and dry weight of only grassy weeds compared with weedy check.

Acetachlor applied 3 days after transplanting (DAT) or 8 DAT brought about similar reduction in dry weight of weeds. Higher dose of acetachlor (150 g a.i./ha) and ready mixture of anilofos + ethoxysulfuron (390 g a.i./ha) proved significantly superior to their lower doses in reducing the density and dry weight of grassy weeds. Tank mixture of anilofos + almix did not prove to be effective on grassy weeds, may be due to lower dose of anilofos in the mixture. Similarly, Jain *et al.* (1998) found lower weed density and weed dry weight with pendimethalin and butachlor respectively.

Yield and yield attributes of rice crop

All the herbicidal treatments gave significantly higher yield and yield attributes than weedy check. This may be due to the less competition of weeds because herbicidal treatments significantly reduced the density and dry weight of weeds (Table 1). Narayana *et al.* (1999) obtained similar results using metsulfuron. Acetachlor at 150 g a.i./ha applied 3 DAT, ready mixture of anilofos + ethoxysulfuron at 390 g a.i./ha applied 8 DAT and butachlor at 1,500 g a.i./ha gave similar number of tillers/m^2,

Table 1. Effect of weed-control treatments on weed density and weed dry weight at 60 days after transplanting

Treatment	Dose (g/ha)	Time of application	Weed density (no./m²)				Weed biomass (g/m²)			
			Grassy		Broad-leaved		Grassy		Broad-leaved	
			1999	2000	1999	2000	1999	2000	1999	2000
Acetachlor	75	3 DAT	7.74* (59.0)	7.68 (58.0)	5.3 (28.0)	5.1 25.0	50.0	49.0	1.92	1.65
Acetachlor	100	3 DAT	6.08 (36.0)	6.0 (35.0)	4.0 (15.0)	3.8 13.0	42.5	41.0	1.19	1.10
Acetachlor	125	3 DAT	5.38 (28.0)	5.1 (25.0)	3.3 (10.0)	3.0 8.0	2.4	2.2	0.90	0.85
Acetachlor	150	3 DAT	4.5 (20.0)	1.3 (18.0)	2.8 (7.0)	2.6 6.0	18.8	17.9	0.56	0.54
Acetachlor	300	3 DAT	3.0 (8.0)	2.7 (6.0)	2.0 (3.0)	1.9 3.0	6.2	5.8	0.32	0.31
Acetachlor	75	8 DAT	8.18 (66.0)	8.01 (63.0)	4.8 (23.0)	4.5 20.0	56.7	54.9	1.78	1.59
Acetachlor	100	8 DAT	6.32 (39.0)	6.23 (38.0)	3.8 (14.0)	3.6 12.0	42.9	41.2	1.16	1.06
Acetachlor	125	8 DAT	5.56 (30.0)	5.42 (28.0)	3.1 (9.0)	3.0 8.0	35.7	33.9	0.71	0.68
Acetachlor	150	8 DAT	4.0 (15.0)	3.89 (14.0)	2.6 (6.0)	2.5 5.0	21.7	20.7	0.58	0.49
Acetachlor	300	8 DAT	2.23 (4.0)	2.23 (4.0)	2.2 (4.0)	2.0 3.0	7.1	6.5	0.36	0.36
Anilofos+ Ethoxysulfuron	260	8 DAT	6.92 (47.0)	6.58 (42.0)	4.6 (21.0)	4.2 17.0	53.7	52.0	1.65	1.59
Anilofos+ Ethoxysulfuron	325	8 DAT	5.65 (31.0)	5.58 (930.0)	3.7 (13.0)	3.4 11.0	34.5	33.9	1.29	1.24
Anilofos+ Ethoxysulfuron	390	8 DAT	4.12 (16.0)	4.10 (16.0)	2.6 (6.0)	2.6 6.0	22.3	22.0	0.69	0.64
Anilofos+ Ethoxysulfuron	780	8 DAT	2.0 (3.0)	1.89 (3.0)	2.0 (3.0)	1.8 2.0	4.9	4.2	0.32	0.31
Anilofos+ Ethoxysulfuron	200+4	8 DAT	6.63 (43.0)	6.57 (42.0)	1.7 (2.0)	1.5 1.0	46.4	45.2	0.27	0.24
Butachlor	1,500	3 DAT	3.87 (14.0)	3.68 (13.0)	6.0 (35.0)	6.0 35.0	21.7	20.5	2.38	2.09
Weedy check			15.03 (225.0)	14.89 (221.0)	6.3 (39.0)	6.2 36.0	194.1	190.3	2.56	2.50
Weed free			1	1	1	1	-		-	-
CD (P=0.05)			0.76	0.80	0.57	0.61	1.63	1.59	NS	1.3

*Values are square-root transformed and original values are given in parentheses

Table 2. Effect of weed-control treatments on yield and yield attributes of rice crop

Treatment	Dose (g a.i./ha)	Time of application	Tillers/m²		Grains/panicle		Length of panicle (cm)		1,000-grain weight (g)		Grain yield (kg/ha)	
			1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
Acetachlor	75	3 DAT	63.0	62.0	109.0	106.0	22.4	21.5	24.0	23.0	5,817	5,586
Acetachlor	100	3 DAT	68.0	65.0	116.0	108.0	23.8	22.4	24.4	23.9	6,249	5,983
Acetachlor	125	3 DAT	71.0	68.0	119.0	112.0	24.1	22.7	24.9	21.0	6,590	6,191
Acetachlor	150	3 DAT	76.0	75.0	126.0	117.0	24.9	23.2	25.6	25.1	7,049	6,773
Acetachlor	300	3 DAT	77.0	76.0	126.0	110.0	24.4	22.3	25.0	24.6	7,098	6,608
Acetachlor	75	8 DAT	63.0	61.0	107.0	103.0	22.7	21.1	23.9	22.9	5,678	5,418
Acetachlor	100	8 DAT	68.0	64.0	111.0	110.0	23.4	22.3	24.4	23.9	6,170	5,810
Acetachlor	125	8 DAT	70.0	69.0	116.0	112.0	24.1	22.4	25.0	24.0	6,455	6,073
Acetachlor	150	8 DAT	74.0	72.0	124.0	114.0	24.9	22.5	25.9	25.3	6,978	6,531
Acetachlor	300	8 DAT	75.0	73.0	123.0	110.0	24.3	22.0	25.1	24.7	6,989	6,766
Anilofos + ethoxysulfuron	260	8 DAT	68.0	64.0	111.0	105.0	22.8	21.7	24.0	23.8	5,988	5,604
Anilofos + ethoxysulfuron	325	8 DAT	73.0	71.0	116.0	111.0	23.6	22.3	24.4	23.9	6,607	6,347
Anilofos + ethoxysulfuron	390	8 DAT	75.0	73.0	124.0	115.0	24.2	22.9	25.1	24.7	6,989	6,850
Anilofos + ethoxysulfuron	780	8 DAT	71.0	70.0	114.0	108.0	23.3	22.0	23.4	22.9	6,620	6,642
Anilofos + almix	200+4	8 DAT	66.0	64.0	116.0	107.0	22.6	22.0	24.3	23.8	6,077	5,442
Butachlor	1,500	8 DAT	75.0	73.0	125.0	113.0	24.3	22.7	24.7	24.1	7,003	6,863
Weedy check		8 DAT	59.0	58.0	100.0	98.7	22.1	20.4	23.4	22.8	4,995	4,819
Weed free		8 DAT	79.0	77.0	127.0	117.0	24.9	23.2	25.8	24.8	7,150	6,938
CD (P=0.05)		3 DAT	3.44	3.06	4.87	5.28	0.83	0.99	0.76	0.82	203	228.0

DAT, Days after transplanting

grains/panicle, length/ panicle, 1,000-grain weight and grain yield of rice to that of weed-free treatments. Acetachlor applied 3 DAT or 8 DAT resulted in similar grain yield of rice. Higher dose of acetachlor (300 g a.i./ha) and ready mixture of anilofos + ethoxysulfuron (780 g a.i./ha) did not increase the yield and yield attributes of rice crop due to phytotoxic effect on crop.

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