

Effect of herbicide on direct-sown, drilled rice (*Oryza sativa*) and associated weeds

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ABSTRACT

Butachlor, thiobencarb, pendimethalin and anilophos were evaluated for weed control in direct-sown, upland rice (*Oryza sativa* L.) *Echinochloa colonum* (L.) Link, *E. crus-galli* (L.) Beauv., *Cyperus iria* L., *Alternanthera sessilis* DC. and *Commelina communis* L. were the major weeds in the experimental field.

Population and dry weight of weeds were reduced significantly due to application of herbicides. Butachlor and thiobencarb at 2 kg/ha resulted in maximum decrease in weed dry weight. Butachlor and thiobencarb (2 kg/ha) proved more effective in controlling grass weeds than pendimethalin and anilophos. Herbicides application resulted in almost similar increase in grain yield.

Severe weed competition is a major barrier for increased productivity of upland, direct-seeded rice (*Oryza sativa* L.). Their importance bring about losses caused by weeds in upland rice to the extent of 50–60% and sometimes complete crop failure is also not uncommon (Pillai, 1977; Singh and Mani, 1981).

Mechanical methods which is in vogue many times cannot be used due to continuous rains that prevail during the season. Use of chemical to control weed has been found effective and economical (Pillai, 1977; Singh and Mani 1981). In the light of above reports, the present investigation was undertaken to study the effectiveness of herbicides and their rate in controlling weeds in direct-sown, drilled rice.

MATERIALS AND METHODS

The field experiment was conducted at

the National Research Centre on Weed Science, Jabalpur, during rainy season of 1991 and 1992. The experiments consisted of weedy check, weed-free along with herbicides, viz. butachlor, thiobencarb and pendimethalin @ 1, 1.5 and 2.0 kg/ha; and anilophos @ 0.3, 0.4% 0.5 kg/ha. The treatments were tested in randomized block design with 3 replications.

The soil of the experimental field was medium black, clay loam in texture having pH 6.7 with available N 240 kg/ha, P₂O₅ 8.5 kg/ha and K₂O 460 kg/ha. The rainfall was 1,304 and 1,055 mm during 1991 and 1992 respectively. Seeds of 'Kranti' rice were drilled in rows 23 cm apart on 10 and 18 June in 1991 and 1992 respectively. A basal dose of 50 kg N/ha, 40 kg. P₂O₅/ha and 25 kg. ZnSO₄/ha was applied at the time of sowing. Another 50 kg N/ha was applied in 2 equal splits, 30 and 60 days after sowing

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Table 1. Effect of herbicides on weed population, weed dry weight, yield attributes and grain yield of drilled rice

Treatment	Rate (kg/ha)	Weed population/ m ² at 60 DAS*		Weed dry weight (g/m ²) at 60 DAS*		Productive tillers/m row		1,000-grain weight (g)		Filled spikelet (%)		Grain yield (kg/ha)	
		1991	1992	1991	1992	1991	1992	1991	1992	1991	1992	1991	1992
Butachlor	1.0	8.44	8.73	7.63	7.88	53.30	48.03	30.40	82.87	80.70	42.33	48.07	
Butachlor	1.5	8.68	8.45	7.14	6.82	48.80	47.50	30.20	30.13	82.00	83.70	44.67	51.88
Butachlor	2.0	8.15	7.05	6.08	6.01	49.47	47.13	30.17	30.36	82.37	83.03	48.84	48.33
Thiobencarb	1.0	9.03	8.25	8.63	8.65	47.63	48.90	30.03	30.97	82.53	82.07	49.89	45.22
Thiobencarb	1.5	9.11	9.07	8.16	8.00	47.73	49.83	30.43	30.53	82.83	84.83	46.15	47.03
Thiobencarb	2.0	8.05	8.14	7.25	6.96	49.87	49.66	30.57	30.06	82.93	84.83	48.25	48.03
Pendimethalin	1.0	9.40	8.97	7.69	8.35	52.60	49.93	30.27	29.97	83.13	83.50	45.29	48.93
Pendimethalin	1.5	8.09	8.97	7.72	7.54	50.77	51.00	30.60	30.07	83.90	86.80	52.75	48.38
Pendimethalin	2.0	8.71	8.62	7.64	6.76	52.57	50.60	30.50	30.57	83.00	85.03	47.23	47.67
Anilophos	0.3	8.41	8.17	6.93	6.82	49.47	49.00	30.03	30.40	83.53	84.63	49.89	47.13
Anilophos	0.4	7.55	8.57	6.06	6.24	51.00	49.90	30.17	30.40	83.13	83.10	51.06	47.83
Anilphos	0.5	7.74	8.07	6.31	5.92	51.57	50.40	30.70	29.63	81.07	82.67	51.76	48.45
Weed free		2.93	3.39	0.71	0.71	53.13	53.80	30.93	30.27	84.60	88.27	54.39	57.83
Weedy check		14.03	12.75	14.40	15.76	27.97	29.10	29.62	29.30	80.17	82.17	35.21	33.84
CD (P = 0.05)		1.63	00.71	00.94	00.71	04.75	02.34	00.50	00.71	03.06	04.40	08.37	04.37

*Transformed Value

(DAS). Herbicides were applied just after sowing as pre-emergence. A quadrat of 25 cm x 25 cm was placed at 2 randomly selected spots in each plot for weed counts at 60 DAS.

RESULTS AND DISCUSSION

The major weeds that infested the field were : *Echinochloa colonum* (L.) Link, *E. crus-galli* (L.) Beauv., *Commelina communis* L., *Alternanthera sessilis* DC., *Caesulia auxillaris*, *Cyperus iria* L. and *C. difformis* L. All weed-control treatments markedly reduced the population of weeds. The maximum reduction in weed population and weed dry weight was under butachlor at 2.0 kg/ha, followed by anilophos (Table 1). Butachlor and thiobencarb @ 2.0 kg/ha gave better control of *Echinochloa* sp. than pendimethalin (2 kg/ha) and anilophos (0.5 kg/ha), whereas latter were more effective against *Sessilis* sp. and *C. communis*. Similar results were obtained by Bhan *et al.* (1986).

Dry-matter production of weeds reduced significantly with the increase in the rate of butachlor and thiobencarb up to 2 kg/ha (Table 1). No such reduction under pendimethalin and anilophos was observed with increase in rate except in 1991 when pendimethalin increased rate from 1 to 2 kg/ha resulted in lower dry-matter accumulation of weeds significantly.

Effect on yield attributes and yield

In the initial stages of crop growth butachlor at higher rates 1.5 and 2.0 kg/ha showed phytotoxicity on rice; however, the crop recovered. The productive tillers/m running row recorded at maturity revealed that anilophos at 0.5 kg/ha recorded highest number of productive tillers/m running row and this was closely followed by pendimethalin (2 kg/ha, 1 kg/ha) and butachlor (2 kg/ha) (Table 1). Severe weed

infestation in unweeded plots resulted in lowest number of tillers/m running row. All the weed-control treatments caused significant increase in 1,000 grain weight and reduction in grain sterility. The increase in yield attributes in weed-control treatment may be attributed to proper increase in availability of nutrients, water, light and space to crops as a result of effective weed control (Sharma *et al.*, 1986). All weed-control treatments caused significant increase in grain yield than unweeded plots. Highest grain yield (50.09 q/ha) was recorded in anilophos at 0.5 kg/ha. Application of butachlor (1.5 and 2.0 kg/ha), thiobencarb (2 kg/ha) and anilophos (0.4 kg/ha) were found very promising for controlling weeds. Ghosh and Singh (1987) reported similar results. Effect of pendimethalin (at 1.5 kg/ha) was not constant; it recorded quite high level in 1991 but its effect was not so marked in 1992.

Negative correlation of weeds with grain yield was observed. Similar result was also observed by Bhan *et al.* (1986). The competing ability of direct-seeded rice was negatively correlated with the dry-matter production of weeds. With increase in each unit of dry weight, the grain yield reduced by 1.23 g/m².

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