

Effect of various weed control methods on yield and nutrient uptake in low land transplanted rice (*Oryza sativa* L.)

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ABSTRACT

The experiment was conducted with twenty treatments consisting of different herbicides, their combination and dose, manual and cultural methods. As compared to weed free situation (7.4 t/ha) situation there was only 1.4, 1.3 and 9.0 per cent reduction in grain yield under Anilophos + 2,4-DEE (0.4+0.53 kg ai /ha) T₈, two hand weedings T₁₈ and Butachlor (1.5 kg ai/ha) T₉. When compared with Butachlor, the herbicide check at 1.5 kg ai /ha (112 kg N/ha, 29kg P/ha and 108 kg K/ha) none of the weed control treatments had increased nutrients uptake in crop. So competition for nutrients was less in treated plots over non-weeded control. Straw yield and grain /straw ratio under different weed control treatments were observed with non- significant variation. None of the herbicides were found significantly superior to the Butachlor (1.5 kg ai/ha) herbicide check T₉.

Key words : Rice, Anilophos, +2, 4-DEE, Oxadizaon, Butachlor.

INTRODUCTION

Rice (*Oryza sativa* L.) is a principal and extensively grown crop of India. But the average yields of rice in the country is very low as compared to the world average. There is more scope to increase the average yields of rice provided improved package of practices are adopted. Control of weed is one of the important and necessary practice in the management of rice crop.

Crops and weed compete for the same nutrients, water, light and space. Weeds by virtue of their wider adaptability and faster growth dominate the crops habitat and reduce the yield potential (Raju and Reddy, 1986). Historically, hand weeding proved to be the most effective method in controlling weeds as compared to chemical and mechanical method. Though hand weeding is very effective but tedious, time consuming and up to some extent expensive. In such situations herbicides can take care of weeds right from the beginning of crop growth and increase rice yields. In India use of butachlor as the pre-emergence herbicide is recommended for weed control in transplanted rice. (Bhan *et al.*, 1985; Singh and Bhandari, 1986). Herbicide alone could not control weeds effectively. However some workers reported that herbicides were effective only when their application was followed by single hand weeding (Subbian, 1983). To investigate the effect of different methods of weed control on weeds and their resultant effect on growth and yield of low land transplanted rice. A field experiment was conducted at G. B. Pant University of Agriculture and Technology, Pantnagar, Uttaranchal.

MATERIALS AND METHODS

The experiment was conducted with twenty treatments. Treatments consisting of different herbicides, their combination and dose, manual and cultural methods were studied in a Randomized Block design with four replications.

Herbicides were applied 3 days after transplanting (pre-emergence) as spray in solution form at the rate of 800-1000 l/ha. Granular formulation of Anilophos was applied directly in granule form. Weeding in weed free and two hand weeding treatments were done manually. Rice variety "Pant dhan-4" a cross of IR x Ramadja was used in the experiment. Seedlings were transplanted in rows manually at 20 cm x 20 cm distance except high plant population+1hand weeding where 15 cm x 15 cm distance was kept. After seedling establishment 5 cm standing water level was maintained up to milk dough stage.

The data on yield and nutrient uptake were analyzed by using the analysis of variance technique as suggested by Panse and

Sukhatme (1967).

RESULTS AND DISCUSSION

Grain yield recorded under different weed control treatments ranged from 42 to 31 per cent higher than the yield recorded under non weeded control. Thus all weed control treatments were found promising and resulted in an increase in grain yield.

Significant weed control was achieved by the use of Anilophos (2% G at 0.6 kg ai /ha) T₄, Anilophos +2,4-DEE (0.4+0.53 kg ai/ha) T₈, high plant population +1hand weeding T₁₇, Oxadiazon (0.375 kg ai/ha) T₁₅, Butachlor +2,4-DEE (1.0+0.4 kg ai/ha) T₁₀, 2,4-DEE (0.8 kg ai/ha) T₂ and their effectiveness was statistically comparable to weed free situation (7.4 t/ha) and Butachlor (1.5 kg ai /ha), the herbicide check (6.7 t/ha) T₉.

Apart from above treatments Anilophos (0.4 kg ai /ha) T₃, Pretilachlor (0.5, 0.75 kg ai/ha) T₁₁ & T₁₂, 2,4-DEE (0.4 kg ai/ha) T₁ and Oxyflourfen (0.05 kg ai/ha) T₁₃ gave yield statistically at par with Butachlor (1.5 kg ai/ha) T₉, the herbicide check. None of the herbicides were found significantly superior to the Butachlor (1.5 kg ai/ha) herbicide check T₉. As compared to weed free situation there was only 1.4, 1.3 and 9.0 per cent reduction in grain yield under Anilophos + 2,4-DEE (0.4+0.53 kg ai /ha) T₈, two hand weedings T₁₈ and Butachlor (1.5 kg ai/ha) T₉.

Increase in yield due to herbicides has been reported in a number of studies. Azad *et al.* (1990) reported 30-37 per cent increase in yield due to Oxyflourfen.

Bhattacharya and Kole (1985) found 28 to 56 per cent increase in yield due to Oxadiazon. Pandey and Thakur (1988) found 19 per cent increase in yield by application of Anilophos+2,4-DEE (0.3+0.8 kg ai/ha). Straw yield and grain /straw ratio under different weed control treatments were observed with non- significant variation.

Treatments Anilophos+ 2,4-DEE (0.4+0.53kg ai/ha) T₈, Anilophos+ 2,4-DEE (0.6 kg ai/ha) T₄, Anilophos+ 2,4-DEE (0.3+0.4 kg ai/ha) T₇, Butachlor +2,4-DEE (1.0+0.4 kg ai/ha) T₁₀, Anilophos (0.4 kg. ai/ha) T₆, High plant population + 1 hand weeding T₁₇, 2,4-DEE (0.8 kg ai /ha) T₂, Pretilachlor (0.75 kg ai /ha) T₁₂, Oxadiazon (0.375) T₁₅ were found to remove nitrogen ranging from 102 to 125 Kg N/ha and these were found comparable with Butachlor (1.5 kg ai/ha) T₉ and two hand weedings T₁₈. Under weed free condition nitrogen uptake was 137 Kg/ha recorded.

Weed control treatments were found to influence the total P uptake by crop significantly. The highest uptake of total P was recorded in weed free situation followed by two hand weedings, (0.4+0.53kg ai/ha) T₈, Anilophos+ 2,4-DEE (0.6 kg ai/ha) T₄, Anilophos + 2,4-DEE (0.3+0.4) T₇. Butachlor (1.5 kg ai/ha) T₉ was found to

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Table 1 : Grain, straw yield, grain straw ratio as influenced by various weed control treatments

Treatments	Concentration (%)	Dosage (Kg. ai/ha)	Grain yield (t/ha)	Straw yield (t/ha)	Grain/ straw ratio
T ₁ - 2,4 -DEE	36 AE	0.4	6.07	6.13	0.99
T ₂ - 2,4- DEE	36 AE	0.8	6.60	6.00	1.10
T ₃ -Anilophos	2%G	0.4	5.49	5.60	0.98
T ₄ -Anilophos	2%G	0.6	7.00	6.86	1.02
T ₅ - Anilophos	30EC	0.3	5.87	6.31	0.93
T ₆ - Anilophos	30EC	0.4	6.44	6.85	0.94
T ₇ - Anilophos+2,4- DEE	24+32EC	0.3+0.4	6.97	6.64	1.05
T ₈ - Anilophos+2,4- DEE	24+32EC	0.4+0.53	7.33	7.26	1.01
T ₉ - Butachlor	50EC	1.5	6.72	6.34	1.06
T ₁₀ - Butachlor +2,4- DEE	50EC+36AE	1.0+0.4	6.74	6.81	0.99
T ₁₁ -Pretilachlor	50EC	0.50	6.43	6.70	0.96
T ₁₂ - Pretilachlor	50EC	0.75	6.35	5.93	1.07
T ₁₃ -Oxyfluorfen	25WP	0.05	5.92	6.10	0.97
T ₁₄ - Oxyfluorfen	25WP	0.10	5.44	6.11	0.89
T ₁₅ Oxadiazon	25EC	0.375	6.84	5.70	1.20
T ₁₆ Anilophos+2,4- DEE	30EC	0.4	5.83	5.11	1.14
T ₁₇ -High plant poulation + one hand weeding (30DAT)			6.89	6.82	1.01
T ₁₈ -Two hand weeding (30, 60 DAT)			7.19	7.82	0.92
T ₁₉ -Weed free check			7.35	7.50	0.98
T ₂₀ -Non weeded control			4.15	4.41	0.94
S.Em±			0.29	0.50	0.096
Cd at 5%			0.83	NS	NS

Table 2 : Nutrients uptake by crop as influenced by various weed control treatments

Treatments	Concentration (%)	Dosage (Kg. ai/ha)	Nutrients uptake by crop (kg./ha)		
			Nitrogen	Phosphorus	Potassium
T ₁ - 2,4 -DEE	36 AE	0.4	99.2	26.34	100.3
T ₂ - 2,4- DEE	36 AE	0.8	105.6	27.41	106.4
T ₃ -Anilophos	2%G	0.4	85.3	22.74	95.7
T ₄ -Anilophos	2%G	0.6	114.6	31.69	93.9
T ₅ - Anilophos	30EC	0.3	98.8	24.75	100.7
T ₆ - Anilophos	30EC	0.4	107.2	27.91	110.9
T ₇ - Anilophos+2,4- DEE	24+32EC	0.3+0.4	111.3	30.45	114.0
T ₈ - Anilophos+2,4- DEE	24+32EC	0.4+0.53	125.2	31.88	127.6
T ₉ - Butachlor	50EC	1.5	111.8	29.17	107.7
T ₁₀ - Butachlor +2,4- DEE	50EC+36AE	1.0+0.4	107.9	28.64	113.9
T ₁₁ -Pretilachlor	50EC	0.50	97.1	23.72	107.9
T ₁₂ - Pretilachlor	50EC	0.75	105.3	27.52	111.1
T ₁₃ -Oxyfluorfen	25WP	0.05	94.6	23.61	103.2
T ₁₄ - Oxyfluorfen	25WP	0.10	84.9	23.58	99.6
T ₁₅ Oxadiazon	25EC	0.375	102.0	27.43	93.8
T ₁₆ Anilophos+2,4- DEE	30EC	0.4	93.0	25.54	109.3
T ₁₇ -High plant poulation + one hand weeding (30DAT)			106.9	28.82	111.9
T ₁₈ -Two hand weeding (30, 60 DAT)			115.7	32.35	121.6
T ₁₉ -Weed free check			136.7	34.12	121.8
T ₂₀ -Non weeded control			67.3	18.59	82.6
S.Em±			5.45	1.83	
Cd at 5%			15.43	5.17	NS

close these treatments. Effect of different weed control treatments on potassium uptake by crop was non- significant. The range of total K uptake was 127kg K/ha to 83kg K/ha recorded.

The increase in grain yield in all the weed control treatments over non-weeded control can further be supported by nutrients uptake by crop plants at maturity stage. When compared with Butachlor, the herbicide check at 1.5 kg ai /ha (112 kg N/ha, 29kg P/ha and 108 kg K/ha) none of the weed control treatments had increased nutrients uptake by crop. So competition for nutrients was less in treated plots over non-weeded control. Increase in nutrient uptake by crop was also supported by Pillai *et al* 1976 .

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