

Effect of Minimum Tillage and Different Methods of Weed Control in Transplanted Rice, IR 20

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ABSTRACT

Minimum tillage treatments with Paraquat at the rate of 0.8 and 1.2 kg a. i./ha produced the same grain yield in IR 20 rice as puddling the soil 6 and 9 times. Paraquat suppressed all kinds of weeds and also killed the stubbles of the previous rice crop and can therefore substitute puddling. The weed infestation reduced the grain yield by 20.95 per cent. Hand weeding and working rotary weeder recorded maximum yields and net profit and also efficiently controlled the weeds. Propanil and butachlor were on par and significantly superior to unweeded check. The weed control efficiency was 80.92, 47.11 and 28.60 per cent for hand weeding, Stam F. 34 and Machete respectively.

INTRODUCTION

Land preparation for rice cropping in the conventional method is laborious, time consuming and expensive. Minimal tillage or chemical ploughing by the use of herbicides is a recent technique minimising labour and time. According to Misra and Lenka (1973) paraquat can substitute puddling and spray of propanil can check weeds and save irrigation water without reducing the yield of rice. Paraquat has been found to be quite effective in suppressing all categories of weeds as well as the rice stubbles at a dose more than 1.25 l/ha (Mukhopadhyay and Rooj, 1971). The present study was undertaken to investigate the effectiveness of minimal cultivation technique with the use of paraquat for transplant rice and check the subsequent weed growth by chemical rather than cultural methods of weed control.

MATERIALS AND METHODS

The field experiments were carried out at the Agricultural College Farm, Madurai during the first crop (June to October) and second crop (October to February) season of 1972-73 in split plot design with four replications. The main plot treatments consisted of control one, three, six and nine puddlings, and preplant application of paraquat (1:1-Dimethyl 4:4'-bipyridylum dichloride) at 0.4, 0.8 and 1.2kg a. i./ha. There were five sub-plot treatments viz. control (unweeded) hand weeding twice on 15th and 30th day after planting, working rotary weeder twice on 20th and 30th day after planting, uropanil (3,4-dichloropropionanilide) at 3.0 kg a. i/ha and butachlor (2-chloro-2; 6' -diethyl-N- (Butoxy methyl)-acetanilide) spray at 2.5 kg a. i/ha. Paraquat was sprayed five days before planting the seedlings followed by one puddling to facilitate

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the planting of seedlings. The plot size was 4m × 5m. Rice variety IR 20 was raised during both the seasons. Weed count was taken 45 days after planting and weed weight recorded at the time of harvest of the crop. Data on plant characters such as number of productive tillers, plant height, grain and straw yield were recorded and statistically analysed. Weed index was worked out on the method of Gill and Vijayakumar (1969). Weed control efficiency (W.E) was worked out by the formulae $W.E = \frac{Wpc - Wpt}{Wpc} \times 100$

where Wpc = weed population in control plot and Wpt = weed population in treated plots.

RESULTS AND DISCUSSION

The predominant weeds in the experimental field consisted of nutsedge (*Cyperus* spp.), barnyardgrass (*Echinochloa crusgalli*), *Marsilia quadrifolia* and water grass (*Brachiaria mutica*). These weeds constituted the major bulk of the hard to kill weeds.

Weed population: The weed population in different treatments indicates that the infestation of weeds in the unweeded check to be 188 per square metre (Table 1). There was no significant difference in weed population among the different tillage treatments in both seasons. As for the different methods of weed control, hand weeding and working the rotary weeder significantly reduced the weed population by 72 and 69 per cent over the unweeded check. The two herbicides, butachlor and propanil were on par and significantly reduced

the weed population by 37 and 48 per cent. The interaction was not significant in both seasons.

Weed weight: The data on weed weight (Table 2) show that there is no significant difference between the different levels of tillage. Hand weeding recorded the lowest weed weight of 9.66 q/ha when compared with 26.58 and 34.48 q/ha by propanil and butachlor respectively. The maximum depletion of 41.86 kg N per/ha was recorded in the unweeded check. The removal of nitrogen in herbicides plot was 25.30 and 28.72 kg/ha. When compared with hand weeding, N depletion was high in the herbicides plots and unweeded check. As for the tillage treatments, there was no significant difference and application of paraquat at 1.2 kg a. i/ha and puddling the soil 9 times each recorded the lowest nitrogen removal of 18 kg ha when compared with other treatments. This shows that minimal tillage with paraquat is as efficient as the elaborate seed bed preparation for controlling the weed in transplanted rice under wetland condition. The percentage reduction in weed weight showed that hand weeding recorded the maximum efficiency of 81 per cent whereas butachlor and propanil recorded 28.60 and 47.11 per cent respectively.

Grain yield: The grain yield data (Table 1) show significant difference in grain yield between the different tillage treatments only in the first crop season. The minimum tillage treatment with paraquat at 0.8 and 1.2 kg a. i/ha were on par with

TABLE 2. Effect of cultural and chemical methods of weed control on dry weight of weeds and depletion of N at harvest and grain yield of IR 20

S. No.	Treatments	Dry weight of weeds (Q/ha)			Depletion of nitrogen by weeds kg/ha			Weed control efficiency percentage			Weed index percentage		
		First crop	Second crop	Mean	First crop	Second crop	Mean	First crop	Second crop	Mean	First crop	Second crop	Mean
I. Levels of tillage													
	Control	41.50	24.00	32.75	36.14	24.16	30.15	—	—	—	25.06	13.56	19.31
	Three puddlings	31.75	18.40	30.88	32.83	18.58	25.71	23.01	23.33	23.17	14.00	4.95	9.48
	Six puddlings	30.00	14.00	22.00	31.70	14.19	22.95	27.71	41.70	34.70	5.38	3.16	4.27
	Nine puddlings	28.50	11.20	19.85	24.80	11.20	18.00	31.32	49.17	40.25	—	—	—
	Paraquat @ 0.4 kg a. i/ha	34.50	23.20	28.85	29.87	23.34	26.11	16.87	3.33	10.10	12.18	11.34	11.26
	Paraquat @ 0.8 kg a. i/ha	31.50	18.80	25.15	27.04	19.02	23.03	24.34	21.70	23.02	7.55	6.40	6.98
	Paraquat @ 1.2 kg a. i/ha	27.25	14.00	20.63	22.77	14.24	18.01	34.30	41.70	38.00	5.18	1.65	3.42
	SEm	9.64	6.52	—	6.76	10.75	—	—	—	—	—	—	—
	CD at 5%	N. S.	N. S.	—	N. S.	N. S.	—	—	—	—	—	—	—
II. Methods of weed control													
	Unweeded check	56.61	38.04	47.33	47.55	36.17	41.86	—	—	—	22.47	19.46	20.95
	Hand weeding twice	14.64	4.68	9.66	15.97	5.86	5.91	74.14	87.70	80.92	1.65	—	1.65
	Working rotary weeder twice	12.68	8.78	10.73	12.51	9.51	11.01	77.60	76.92	77.26	—	4.42	4.42
	Propanil @ 3 kg a. i/ha	39.64	13.52	26.58	37.20	13.41	25.30	29.77	64.45	47.11	13.33	6.84	10.09
	Butachlor @ 2.5 kg a. i/ha	44.29	24.56	34.43	33.30	24.14	28.72	21.76	35.44	28.60	17.49	9.73	13.61
	SEm	8.8	3.75	—	3.32	3.91	—	—	—	—	—	—	—
	CD at 5%	17.25	7.50	—	6.85	8.07	—	—	—	—	—	—	—

puddling the soil six times and nine times. As for the different methods of weed control, hand weeding on an average recorded 4421 kg when compared with 4009 and 3852 kg/ha by propanil and butachlor respectively. Among the two herbicides, propanil gave consistently better yield than the butachlor. Similar results have been reported by Patil and Chauchan (1972) and Prabhakar et al. (1972).

The weed index computed showed reduction in grain yield to the extent of 20.95 per cent in the unweeded check due to weed growth. Hand weeding recorded the lowest index of 1.65 per cent as compared to 13.61 and 10.09 per cent in butachlor and propanil treatments respectively. Correlation studies between depletion of nitrogen by weeds and grain yield indicated that there was a high negative correlation of (0.717**) and (0.674**) in the first and second crop season respectively. The interaction between the levels of tillage and methods of weed control was not significant in both seasons. Even if the seed bed is not prepared thoroughly as in the case of minimal tillage weeds can be controlled by the different methods of weed control after planting the crop. The plant height and number of productive tillers per clump during the first crop season were significant in the main plot as well as the sub plot treatments indicating that reduction in weed population significantly increase the

height of the plant and the number of productive tillers and the yield of the crop.

Economics: The net profit was worked out by deducting the cost of cultural or chemical methods from the value of additional yield obtained. Maximum profits were obtained by six and nine puddlings and also by spraying paraquat at 4 and 6 l/ha. Hand weeding and working rotary weeder gave the maximum net profit in the different methods of weed control. Out of the two herbicides, Stam F.34 gave consistently more net profit when compared with Machete. At the present rate of wages paid to the labour, cost of herbicide treatment is cheaper than cultural methods of weed control.

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