

Comparative Efficiency of Herbicides in Rice (Var. IR. 20) Under Different Methods of Planting

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ABSTRACT

Experiments were conducted to study the weed control efficiency of herbicides in rice (var. IR. 20), using two forms of pre-emergence herbicides, namely, butachlor (EC) and (G) and a post-emergence herbicide, propanil. The [pre-emergence application of butachlor (G) at 2.0 kg ai/ha and a post-emergence spray of propanil at 3.5 lit. a i./ha gave the best and economical weed control both under direct sown and transplanted conditions.

INTRODUCTION

Weed control in rice are two fold since the crop is either direct sown or transplanted. The yield losses in rice due to weeds ranged from 9.0 to 51.4 per cent (Vachhani *et al.*, 1963; Duara, 1955; Gautam and Mani, 1966; and Mehrotra *et al.*, 1967). Seaman *et al.* (1966) reported that propanil was very effective as an early post-emergence spray especially in direct sown rice. The herbicide was effective on a number of annual grasses such as *Echinochloa crusgalli*, *E. colonum*, *E. crusgavonis*, *Digitaria* sp., *Panicum* sp., *Bracharia platyphylla* and a few broad leaved weeds. Residues in the water effluent from treated fields reported to be negligible. Thankur *et al.* (1967) reported that Stam F.34 at 3.3. lit a i/ha applied three weeks after transplanting

and supplemented with hand weeding and hoeing at fifth week stage controlled 97 per cent of the weed population. Valliant (1967) obtained promising results when post-emergence application of Stam F. 34, at 10 litres product/ha 15 days after planting.

MATERIALS AND METHODS

Field trials were conducted for two seasons (August 1971 to January 1972 and April 1972 to August 1972) in split plot design with three replications. The main plot treatments comprised of two methods of planting i.e. transplanting (M₁) and direct seeding (M₂). The eight weed control methods (T₁ to T₈) were allotted to the sub plots and they were: post emergence propanil (Stam F-34) at 2.5 and 3.5 lit a. i./ha; pre-emergence butachlor (Machete)

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(EC) at 2.5 and 3.5 lit. a.i./ha; pre-emergence butachlor (G) at 2.0 and 3.0 kg a.i./ha; and weeding twice at 21 and 45 days and unweeded control.

The gross and net plot sizes were 5.0 x 2.0 M and 4.70 x 1.80 M respectively. Rice (Var. IR. 20) was sown in nursery on 28-8-71 in 1971 and on 5-4-72 and planted in the main field on 22-9-71 in the first year and 26-4-72 in the second year with a spacing of 20 x 10 cm. Uniform fertilizer dose of 75:35:35 kg of N, P and K/ha was applied. Butachlor (EC) and (G) were applied as pre-emergence to weeds, six days after sowing or transplanting. Before the application of chemicals, the water in the field was drained completely. To have a uniform distribution granules were mixed with sand applied. The post-emergence application of propanil was applied three weeks after sowing at transplanting as the case may be. Weed count, dry matter production of weed and crop and other biometric observations were recorded.

RESULTS AND DISCUSSION

The results pertaining to crop and weeds are presented in the table 1 and 2 for the first and second seasons respectively.

Plant height at harvest:

The height of the plants were not influenced either by the method of sowing or by the different weed control methods in both the seasons.

Productive tillers per hill:

The differences in the number of producing tillers due to different methods of planting were not significant, but not so far different weed control treatments. In both the seasons, maximum productive tillers were obtained in the butachlor (G) at 2.0 kg a.i./ha followed by the same chemical at 3.0 kg a.i./ha. Unweeded control recorded the lowest number of productive tillers/sq. m.

Weed populations:

Cyperus sp. was the predominant weed in the experimental area and the control plot was fully infested with this weed in direct sown rice. Other major weeds were *Marsilia* sp. and *Echinochloa colonum*. The weed population in the direct sown rice was significantly higher than the transplanted crop in the first season. All the herbicide treatments reduced the weed population considerably. In both the seasons, the unweeded control recorded the maximum number of weeds per sq. m.

Dry matter production of weeds:

The dry matter production of weeds were significantly higher under direct seeded rice in both seasons. But the dry weight difference was more pronounced during the first season. Weed control methods have significantly influenced the dry matter of weeds. Unweeded control recorded the highest dry matter accumulation in weeds. Butachlor (G) and hand weeding recorded the minimum dry matter

TABLE 1: Influence of different weed control methods on crop and weeds 1971-72

	2	3	4	5	6	7	8	9	10
a) Method of Planting									
M ₁ - Transplanting	9.58	61	6	576	4330	5449			
M ₂ - Direct seeding	8.91	264	73	182	3670	4649			
F test	N. S.	Sig.	Sig.	Sig.	Sig.	Sig.			
S. E.	0.33	12.3	8.7	25.1	66	21			
C. D. (P=0.05)	-	75.0	53.0	153.0	400	129			
b) Weed Control Treatment									
T ₁ - Propanil at 2.5 lit. a. i/ha	9.02	140	46	310.6	3720	4958	155	1400	755.00
T ₂ - " 3.5 "	9.27	65	28	394.8	4250	5388	215	1930	1039.50
T ₃ - Butachlor (EC) at 2.5 lit a.i/ha	8.17	191	29	352.0	3840	5044	150	1520	838.00
T ₄ - " 3.5 "	8.27	42	23	452.0	4250	5428	205	1930	1049.50
T ₅ - Butachlor (G) at 2.0kg a.i/ha	12.35	34	12	493.7	5100	6213	125	2780	1617.00
T ₆ - Butachlor (G) at 3.0kg a.i/ha	11.85	35	11	418.3	5080	6302	190	2760	1604.00
T ₇ - Hand weeding twice	10.80	63	21	369.3	4420	5582	234	2200	1196.00
T ₈ - Unweeded control	5.85	509	113	296.0	2320	3740			
F Test	Sig.	Sig.	Sig.	N. S.	Sig.	Sig.			
S. E.	0.424	90.5	16.6	43.86	74	132			
C. D. (P=0.05)	1.21	259	47.0		270	377			

1. Treatments

3. No. of weeds per sq. m.

5. Dry matter of crop (g/sq. m)

7. Straw yield (kg/ha)

9. Additional yield over control (kg/ha)

2. Productive tillers per hill

4. Dry matter of weed per sq. m. in g.

6. Green yield (kg/ha)

8. Cost of weed control (Rs.)

10. Additional income over control (Rs.)

TABLE 2. Influence of different weed control methods on crop and weeds 1972-73.

	1	2	3	4	5	6	7	8	9	10
a) Methods of Planting										
M ₁ —Transplanting		7.72	39.0	11.0	647.7	6550	75.9			
M ₂ —Direct seeding		9.44	48.9	21.0	347.3	6200	7305			
F test		N.S.	N.S.	Sig.	Sig.	Sig.	N. S.			
S. E.		0.39	2.0	1.2	2.7	44	75			
C. D. (P=0.05)				7.3	16.4	270				
b) Weed Control Treatments										
T ₁ —Propanil at 2.5 lit a.i/ha		9.5	73.6	22.0	472	6190	7137	155	950	462.50
T ₂ — „ 3.5 „		8.7	50.5	17.3	485	6770	7705	215	1530	779.50
T ₃ —Butachlor [EC] at 2.5 lit.a.i/ha		8.1	45.8	18.0	426	6130	7274	150	890	428.50
T ₄ — „ 3.5 „		7.1	29.5	11.4	462	6160	7158	205	920	303.00
T ₅ — Butachlor [G] at 2.5kg a i/ha		12.0	10.8	4.6	567	7630	8548	125	2380	1428.50
T ₆ = „ 3.0kg „		11.3	10.3	4.0	562	7220	8348	190	1980	1097.00
T ₇ —Hand weeding twice		10.3	9.6	3.5	536	7370	8552	234	2180	1183.00
T ₈ - Unweeded control		6.26	121.5	47.8	326	5.40	6254			
F test		Sig.	Sig.	Sig.	Sig.	Sig.	Sig.			
S. E.		0.49	6.6	2.4	13.6	156	176			
C. D. (P=0.05)		1.4	18.7	6.9	39	480	503			

1. Treatment

3. No. of weeds per sq. m.

5. Dry matter of crop (g/sq m.)

7. Straw yield (kg/ha)

9. Additional yield over control (kg/ha)

2. Productive tillers per hill

4. Dry matter of weeds per [sq. m in g.]

6. Grain yield (kg/ha)

8. Cost of weed control [Rs]

10. Additional income over control [Rs]

TABLE 3. Influence of different weed control methods on the nutrient uptake by rice and weeds on 90th day (1971-72)

Treatments	Dry matter [kg/ha]	Weed			Dry matter kg/ha	Crop		
		Nutrient [kg/ha]				Nutrient [kg/ha]		
		N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O
T ₁	820	13.1	3.9	15.2	5350	72.2	27.3	111.5
T ₂	520	7.8	2.7	8.4	5680	71.0	29.2	109.1
T ₃	730	13.1	3.6	13.0	5545	73.2	22.2	100.9
T ₄	590	11.2	3.0	11.7	5890	83.0	36.2	105.4
T ₅	310	5.1	1.3	5.6	6800	102.7	42.2	130.6
T ₆	285	5.1	1.8	5.4	6915	105.1	42.5	130.7
T ₇	420	7.6	1.8	7.4	6490	102.5	38.3	124.6
T ₈	3250	62.1	20.0	65.3	4320	56.6	19.4	74.3

production. During the first season, the differences among different weed control methods were not significant except to that of unweeded control. In the second season butachlor (G) at 2.0 and 3.0 kg a.i/ha and hand weeding were on par and significantly superior to the other treatments. The reduction in the dry matter under these treatments might be due to the reduction in the population and growth rate of weeds.

Dry matter production of crop per sq. m

In both the crops, the dry weights were significantly more in the transplanted crop on 45th day. Herbicide treatments have not shown any signi-

ficant difference in dry matter in the first crop but gave marked variations in the second crop. Under both the methods of sowing butachlor (G) treated plots recorded significantly higher dry matter production of the crop followed by hand weeding. Unweeded control treatment registered the least dry weight of the crop.

The yield attributes like panicle length, number of grains per earhead and thousand-grain weight were not influenced by different weed control treatments.

Grain yield:

The results are presented in table 1 and 2. The transplanted crop recor-

ded highest yields in both the seasons. The weed control treatments influenced the yield significantly over the unweeded control in both the crops.

In the first season, the grain yield was maximum (5100 kg/ha) in butachlor (G) at 2.0 kg a.i/ha but this was on par with butachlor (G) at 3.0 kg a.i/ha. Butachlor (EC) and propanil (Stam F-34) at 3.5 lit. a.i/ha were on par with hand weeding.

In the second crop, the application of butachlor (G) at 2.0 kg a.i/ha recorded the maximum yield but was on par with hand weeding and butachlor (G) at 3.0 kg a.i/ha. Application of butachlor (G) at 2.0 kg a.i/ha gave consistently the maximum yield.

Propanil at 3.5 lit. a.i/ha post-emergence spray controlled both monocot and dicot weeds. During the first season 4250 kg/ha grain yield was obtained in this treatment as against 4420 kg/ha in the hand weeding treatment. In the second crop, propanil at the same dose recorded 6770 kg/ha while hand weeding yielded 7370 kg/ha.

The yield increases under different weed control treatments were mainly due to reduction in weed population and in the dry matter production of weeds (Tables 1 and 2). This resulted in the increased dry matter production of crops and number of ear-bearing tillers per hill which had a direct relationship on grain yield.

Straw yield:

The weed control treatments influenced the straw yield significantly over unweeded control. Application of butachlor (G) at both the doses tried increase the yield of straw significantly than the rest of the treatments in the first season. In the second season, butachlor (G) was on par with hand weeding.

Economics:

The economics of application of herbicides and hand weeding over control was calculated. The cost of different weed control treatments and the net income are furnished in tables 1 and 2. Application of butachlor granules at 2.0 kg a.i/ha increased the net income of Rs 1617 and Rs. 1428 in the first and second season respectively. This was followed by hand weeding with Rs. 1196 and Rs. 1183. Propanil at 3.5 lit. a.i/ha recorded Rs. 1039.50 and 779.00 respectively for the first and second season. It is, therefore, evident that application of butachlor granules were superior in both the seasons in respect of economy.

Nutrient uptake by weeds and crops:

The nutrient uptake by the crops and weeds for 1971-72 are presented in table 3. The weeds removed 62.1, 20.0 and 65.3 kg while the crop took

56.6, 19.4 and 74.3 kg of N, P₂O₅ and K₂O respectively. The nutrient removal by weeds was minimum under butachlor (G) and hand weeding treatments. Generally, all the weed control treatments reduced the quantity of nutrients removed by weeds by reducing the population of weed and dry matter production.

REFERENCES

- DUARA, B. N. 1955. Weeding increases rice yield. *Rice News Teller*, 2: 68-71.
- GAUTAM, O. P. and V. S. MANI. 1966. Chemical control of weeds in Paddy nursery beds. *Proceedings Second Weed Control Seminar* Hissar, Feb. 14-7.
- MEHROTRA, O. N., R. C. GARG, R. N. TEWARI and SHIVANATH. 1967. Chemical weed control in paddy quoted by Mani *et al.* Losses in crop yield due to weed growth. *Pest Articles and News Summaries Section C*, 1968 14: 142-58.
- SEAMAN, D. E., P. BERKENKOTTER and T. M. CHEN. 1966. Fate and performance of herbicides in California rice fields. *Rice J.* 69: 71-2.
- THANKUR, R. N., S. NEZAMUDDIN, K. M. AGARWAL, N. N. SHARMA and M. AKHTAR. 1967. Effect of Stam F-34, Agroxine 3 and Spontox with and without cultural practices on the control of rice weeds. *Madras agric. J.* 54: 415-20.
- VALLIANT, A. 1967. Chemical control of annual weeds in rice. *Wld. Crops*, 19: 38-44.
- VACHHANI, M. V., M. S. CHOUDHRY and M. N. MITRA. 1963. Control of weeds in rice by selective herbicides. *Indian J. Agron.* 8: 368-77.