

EFFECT OF CHEMICAL AND INTEGRATED WEED MANAGEMENT IN UPLAND RICE

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Abstract: An experiment was conducted to study the effect of different weed management practices in upland rice in Kerala. The average reduction in grain yield due to weed competition was 44 per cent in 1988 and 56 per cent in 1989. During both the years weed free plots recorded grain yield on par with pre-emergence butachlor + 2,4-D at 25 to 30 days after rice emergence (DARE), pre-emergence pendimethalin and pre-emergence pendimethalin followed by either hand weeding once or 2,4-D application at 25 to 30 DARE. Weed control achieved by pre-emergence application of pendimethalin followed by either a post emergence application of 2,4-D or hand weeding once was as effective as maintaining weed free condition throughout the crop growth. Weed control efficiency was higher in the case of pendimethalin when compared to thiobencarb and butachlor.

INTRODUCTION

Weed-crop competition is an important constraint particularly in upland rice culture. Among many factors responsible for low grain yield of rice, weeds are well recognised as the major concern. Weed problem alone leads to 10 to 70 per cent reduction in grain yield in the direct sown areas (Mani *et al.*, 1968; Shetty, 1973) and higher weed growth may result in total failure of rice crop (Anon., 1973). Hand weeding and hoeing are the practices commonly followed for weed control. However, non-availability of labour, high cost involved and the dryness of upland soil do not allow timely and effective weed control. This paper reports the results of an experiment conducted to evaluate the effectiveness of chemical, traditional and integrated weed management practices in upland rice.

MATERIALS AND METHODS

An experiment was conducted in the upland rice fields of the Regional Agricultural Research Station, Pattambi, Kerala during the wet seasons of 1988 and 1989. The soil was sandy loam in texture with pH 5.4 and organic carbon 1.46 per cent. Twelve treatments were replicated

thrice in randomised block design with a gross plot size of 5 x 4 m. The treatments consisted of thiobencarb @ 2.0 kg ai/ha (pre-emergent); thiobencarb @ 1.5 kg ai/ha followed by 2,4-D @ 0.6 kg ai/ha or hand weeding once at 25-30 days after rice emergence (DARE); butachlor @ 2 kg ai/ha (pre-emergent); butachlor @ 1.5 kg ai/ha followed by 2,4-D @ 0.6 kg ai/ha or hand weeding once at 25-30 DARE; pendimethalin @ 1.5 kg ai/ha (pre-emergent); pendimethalin @ 1.0 kg ai/ha followed by 2,4-D @ 0.6 kg ai/ha or hand weeding once at 25-30 DARE; weed free control; hand weeding twice (at 30 and 50 DARE); and unweeded control. A uniform fertilizer dose of 40 kg N, 20 kg P₂O₅ and 20 kg K₂O/ha was applied. The crop was protected against pest and diseases. Weeds were uprooted by placing 0.5 x 0.5 m quadrat at four places at random in each plot at 100 DARE. Weeds thus collected from a quadrat were carefully washed to remove soil particles, roots were cut and removed and the biomass was dried in hot air oven to constant weights. The grain yield from each net plot was computed at 14 per cent moisture and weed control efficiency was worked out as $100(x-y)/x$ where x and y represent weed dry weight in unweeded and weed control treatments respectively.

Table 1. Effect of weed management practices on the weed biomass and weed control efficiency in upland rice at 100 days after rice emergence

Sl. No.	Treatment (ai/ha)	Weed biomass g/m ²		Weed control efficiency, %	
		1988	1989	1988	1989
1	Thiobencarb 50 EC (2.0 kg)	63.33 (7.97)	46.33 (6.84)	12.55	44.84
2	Thiobencarb 50 EC (1.5 kg) + 2,4-D (0.6 kg)	32.18 (6.34)	30.00 (5.55)	55.56	64.29
3	Thiobencarb 50 EC (1.5 kg) + hand weeding once	8.55 (3.01)	15.33 (4.01)	88.19	81.75
4	Butachlor 50 EC (2.0 kg)	53.0 (7.27)	58.0 (7.66)	26.82	30.95
5	Butachlor 50 EC (1.5 kg) + 2,4-D (0.6 kg)	8.62 (3.03)	9.00 (3.15)	88.09	89.22
6	Butachlor 50 EC (1.5 kg) + hand weeding once	2.40 (1.85)	5.33 (2.48)	96.69	93.65
7	Pendimethalin 35 EC (1.5 kg)	7.38(2.89)	5.47 (2.49)	89.21	93.49
8	Pendimethalin 35 EC(1.0 kg) + 2,4-D(0.6 kg)	2.84 (1.86)	1.43 (1.55)	96.08	98.29
9	Pendimethalin 35 EC(1.0 kg) + hand weeding once	1.70 (1.59)	0.93 (1.39)	97.65	98.89
10	Weed free	0 (1.00)	0 (1.00)	-	-
11	Hand weedings twice	7.64 (2.74)	16.3 (3.89)	89.45	80.59
12	Unweeded control	72.42 (8.56)	84.0(9.19)	-	-
CD (0.05)		1.57	1.09	Not analysed	

Figures in parentheses are $X+1$ transformed values

Table 2. Effect of weed management practices on growth and yield of upland rice

Sl. No.	Treatments	Plant height, cm		Grain yield, t/ha		Straw yield, t/ha	
		1988	1989	1988	1989	1988	1989
1	Thiobencarb 50 EC (2.0 kg)	154	130	1.42	0.51	3.25	4.09
2	Thiobencarb 50 EC ((1.5 kg) + 2,4-D (0.6 kg)	153	123	1.67	0.83	4.33	4.13
3	Thiobencarb 50 EC ((1.5 kg) + hand weeding once	145	117	1.48	1.23	4.64	5.87
4	Butachlor 50 EC (2.0 kg)	150	130	1.49	1.00	2.49	4.13
5	Butachlor 50 EC ((1.5 kg) + 2,4-D (0.6 kg)	146	127	1.85	1.07	3.57	5.29
6	Butachlor 50 EC (1.5 kg) + hand weeding once	153	127	1.45	0.98	4.92	5.77
7	Pendimethalin 35 EC (1.5 kg)	154	125	1.98	1.30	3.88	4.48
8	Pendimethalin 35 EC(1.0 kg) + 2,4-D (0.6 kg)	157	127	2.03	1.05	4.10	4.44
9	Pendimethalin 35 EC (1.0 kg) + hand weeding once	141	139	1.88	1.30	4.85	5.75
10	Weed free	143	113	2.09	1.29	5.14	5.50
11	Hand weedings twice	138	121	1.55	1.19	4.30	6.22
12	Unweeded control	137	135	1.17	0.56	3.22	3.85
	CD (0.05)	NS	NS	0.25	0.45	1.25	2.27

RESULTS AND DISCUSSION

Weed flora

The common weeds which infested the field were *Cynodon dactylon* L. Pars., *Panicum ramosum* L., *Cyperus rotundus* L., *Mimosa pudica* L., *Ageratum conizoides* L., *Amaranthus viridis* L., *Phyllanthus niruri* L. and *Leucas aspera* L.

Effect on weeds

Effect of weed management practices on weed biomass and weed control efficiency is presented in Table 1. The traditional practice of hand weeding twice could significantly reduce the weed biomass when compared to unweeded control and this was better than the pre-emergence application of either thiobencarb or butachlor alone and also the application of pre-emergence thiobencarb + post-emergence 2,4-D. The pre-emergence application of pendimethalin and pre-emergence application of either pendimethalin, butachlor or thiobencarb followed by hand weeding once were found equally effective as hand weeding twice. During both the years, pre-emergence application of pendimethalin followed by either a post-emergence application of 2,4-D or hand weeding once was on par with the weed free plot at 100 DARE.

The effect of treatments on weed control efficiency (WCE) revealed that by the pre-emergence application of either thiobencarb or butachlor, the efficiency was very poor (on an average 29 per cent) whereas an additional 2,4-D application or hand weeding at 25-30 DARE increased the efficiency considerably. It is also evident that the pre-emergent application of pendimethalin @ 1.5 kg ai/ha was even better than hand weeding twice and the efficiency could be increased further by adopting any one of the two post

emergence weed management measures.

Effect on crop

The weed management treatments did not influence the plant height during both the years (Table 2). On an average, grain yield in the weed free plot was the highest. During both the years, weed free plots recorded grain yields on par with pre-emergence butachlor + 2,4-D at 25 to 30 DARE, pre-emergence pendimethalin and pre-emergence pendimethalin followed by either hand weeding once or 2,4-D application at 25 to 30 DARE. Due to weed competition alone, the reduction in grain yield was to the tune of 44.18 per cent in 1988 and 56.14 per cent in 1989. Pre-emergence application of thiobencarb @ 2.0 kg ai/ha gave very low grain yield during both the years. The straw yield in plots where pre-emergence application of herbicide was followed by hand weeding once at 25-30 DARE was significantly superior to unweeded control during 1988.

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