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WEED CONTROL IN RICE UNDER SEMI-DRY SYSTEM

The semi-dry system of rice cultivation is in vogue in eighty seven per cent of the area in Kerala during the autumn season (FIB, 1983). Crop-weed competition and the consequent yield loss are severe in this system of cultivation. The yield loss can be as high as 46 percent under unchecked weed growth (De Datta, 1981). The traditional method of hand weeding is cost intensive. In the present context of scarcity of labour availability combined with rising wage rates, chemical control of weeds in direct-sown rice assumes importance (Nair *et al.*, 1974; Subramanian and Ali, 1985). A study was therefore, undertaken during thefirst crop season of 1985-86 at the Regional Agricultural Research Station, Pilicode to find out the most effective weed control method for direct sown rice under the semi-dry system.

The soil of the experimental area was sandy loam of moderate fertility (organic carbon: 1.32%, pH: 5.8, total N: 0.22%). The experiment had eight treatments each replicated thrice in *a* randomised block design. The treatments comprised of penoxalin (pendimethalin) and benthiocarb alone and in combination with 2, 4-D or hand weeding, a weed free check and an unweeded control. Penoxalin and benthiocarb were applied one day after sowing at 1 kg a. i./ha and 2, 4-D 20 days after sowing (DAS) at 1 kg a. i./ha. The commerical products used were Stomp 30 E. C., Saturn 50 E. C. and Fernoxone 80 W. P. respectively. The weed-free check received four manual weedings at DAS, panicle initiation (PI) and flowering stages.

The test variety, Jaya was sown broadcast at the rate of 100 kg per ha. The gross and net plot sizes were 6 x 3 m and 5 x 2 m respectively.

Weed samples were drawn from two sites of 0.25 m^2 outside the net plot and separated into monocots and dicots. The dry matter of weeds was estimated at 30 DAS, flowering and at harvest. Weed control efficiency was worked out using the formula,

$$WCE = \frac{DWC - DWT}{DWC} \times 100 \text{ where,}$$

WCE — weed control efficiency
DWC dry weight of weeds in the absolute control,
DWT dry weight of weeds in the treated plot.

The predominant weed species in the experimental plot were *Echinochloa crus-galli*, *Echinochloa colonum*, *Ischaemum rugosum*, *Cyperus* sp., *Marselia quadrifolia* and *Eichhornia crassipes*.

The pre-emergence herbicides, penoxalin and benthiocarb were effective for weed control in the initial stages of crop growth. They inflicted no mortality on young rice seedlings. Penoxalin, however, was significantly better than

benthiocarb in weed control at all the stages of crop growth. Nevertheless, regeneration of both moncots and dicots occurred in the herbicide treated plots which were effectively controlled either by the application of *2,* 4-D at 20 DAS or by a manual weeding at 30 DAS. In treatment 7 eventhough hand-weeding was given at 15 DAS, the dry weight of monocot weeds at 30 DAS was significantly higher than in weedy check. This may be because at 15 DAS, only the broadleaved weeds could be manually weeded while the monocot weeds were too small for hand-weeding. As a result there was no competition from dicot weeds in hand-weeded treatment up to 30 DAS. Then the monocots would grow vigorously resulting in higher dry matter yield.

The dry matter yields of weeds at flowering and at crop maturity were significantly higher in treatments receiving penoxalin and benthiocarb alone as compared to those receiving 2, 4-D or hand weeding in combination with these pre-emergence herbicides. The untreated control recorded the maximum dry matter yield of weeds at all the stages of growth. It is obvious from these results that pre-emergence application of chemicals *per se* was not effective in controlling weed growth throughout the growth period of the crop and that their application has to be followed by a subsidiary weed control practice. Similar results have been reported by Bulyan (1982) and Singh and Singh (1982).

The magnitude of yield loss due to crop-weed competition could be clearly seen from the grain yield data (Table 3). Penoxalin in combination with hand weeding registered the best yield of 2.62 t/ha, which was closely followed by penoxalin plus 2, 4-D. However, these treatments were on par with the weed free check (2.16 t/ha), benthiocarb plus hand weeding (2.08 t/ha) and benthiocarb plus 2, 4-D (1.55 t/ha). The unweeded control recorded a grain yield of 190 kg/ha, the difference between it and the best treatment (penoxalin + handweeding) being 2.43 t/ha. The above result however, contradicts the finding of Moorthy and Dubey (1981) who observed that penoxalin was not as effective as hand weeding in an year marked by heavy weed incidence and low yield. Effective weed control resulted in better tillering, higher panicle weight and lesser spikelet sterility and these led to higher grain yield (Table 2).

In terms of economics (Table 3), penoxalin in combination with 2, 4-D was the best treatment, registering a return/rupee investment of 8.46 and it was followed by benthiocarb plus 2, 4-D (7.27) and penoxalin plus handweeding (7.08) The weed free treatment recorded a return/rupee investment of 2.27.

The study clearly indicates that economic weed control in direct-sown rice can be achieved by the pre-emergence application of penoxalin or benthiocarb followed by a post-emergence application of 2, 4-D at 20 DAS or by a manual weeding at 30 DAS.

Table 1

Dry matter production (kg/ha) of weeds and weed control efficiency (%) at various growth stages of rice under dry sown conditions as affected by weed control treatments (kharif, 1985)

	Dry matter of weeds									Weed control efficiency		
	at 30 DAS			at flowering			at harvest			at	at	at
	Mono-cot	Dicot	Total	Mono-cot	Dicot	Total	Mono-cot	Dicot	Total	30 DAS	flow-ering	har-vest
Penoxalin alone	37	119	156	709	2520	3229	443	5643	6087	87.1	46.8	38.1
Penoxalin + 2, 4-D	53	119	173	82	306	388	769	234	993	85.8	93.6	89.9
Penoxalin + HW	214	174	388	111	148	259	507	96	603	68.0	957	93.3
Benthiocarb + alone	339	159	498	2781	2485	5267	5611	3920	9531	58.9	13.2	3.1
Benthiocarb + 2, 4-D	277	128	405	1433	1481	2915	2859	2165	5023	66.7	52.0	48.9
Benthiocarb + HW	258	114	365	941	462	1403	1737	253	1991	69 9	76.9	79.8
Handweeding	1001	187	1189	237	69	306	989	100	1089	1.9	95.0	88.9
Weedy check	856	356	1212	3615	2453	6067	7539	2295	9833	0	0	0
CD (0.05)	48.1	NS	50.6	140.0	192.2	250.6	339.2	245.4	340.7			

Table 2

Yield contributing characters of rice under dry sown conditions as affected by weed control treatments

Treatment	Tiller number		Filled grains		Sterile grains (%)
	Total	Effective	Weight (g)	Number	
Penoxalin alone	2.80	1.93	1.56	55.27	15.24
Penoxalin + 2, 4-D	3 67	2.33	2.20	70.43	16.77
Penoxalin + HW	3.73	2.10	1.83	62.50	19.11
Benthiocarb alone	2.83	1.67	0.93	32.00	35.82
Benthiocarb + 2, 4-D	2.57	1.70	1.37	46.57	22.75
Benthiocarb + HW	2.90	1.80	1.63	55.30	19.00
Handweeding	3.47	2.70	1.57	56.07	20.02
Weedy check	2.70	1.90	0.83	29.53	31.66
CD (0.05)	0.554	NS	0.761	24.153	NS

Table 3

Grain yield of rice under dry sown conditions as affected by weed control treatments and economics of weed control treatments

Treatments	Grain yield (kg/ha)	Price of produce (Rs.)	Cost of weed control (Rs.)	Return/Rupee invested on weed control
Penoxalin alone	980	2450	423	4.67
Penoxalin + 2, 4-D	2560	6400	700	8.46
Penoxalin + HW	2620	6550	858	7.08
Benthiocarb alone	400	1000	297	1.77
Benthiocarb + 2, 4-D	1550	3875	468	7.27
Benthiocarb + HW	2080	5200	877	5.39
Hand weeding	2160	5400	2170	2.27
Weedy check	190	475	0	—
CD (0.05)	1184	—	—	—

Price of grain: Rs. 2.5/kg; Cost of Stomp/Saturn: Rs. 94.5/litre; Cost of Fernoxone: Rs. 50/kg. Cost of herbicide application: Rs. 108/application Cost of labour (man): Rs. 27/day; Cost of labour (women): Rs. 25/day; Total No. of woman days in T7 = 86.8, in T3 = 17.4; in T6 = 23.2

സംഗ്രഹം

പൊടിവിത അനുവർത്തിച്ച നെൽപ്പാടങ്ങളിൽ വിതച്ച ഉടനെ പിനോക്സാലിൻ, ബന്ഥിയോകാർബ് (ഹെക്ടറിന് 1 കി.ഗ്രാം g. അ.) ഇവയിലേതെങ്കിലും ഒരു കള

നാശിനി തളിക്കുകയും തുടർന്ന് 20 ദിവസത്തിനു ശേഷം 2, 4-ഡി (ഹെക്ടറിന് 1 കി. ഗ്രാം g. അം.) തളിക്കുകയും rara^gjajTraJ 30 ദിവസത്തിനുശേഷം OTrarijscofiijT^jT^gg കളകൾ കൈകൊണ്ടു പറിച്ചു നീക്കുകയും ചെയ്യുന്നതായാൽ കളനിയന്ത്രണം വളരെ ലാഭകരമായി സാധിക്കാമെന്ന് പിലിക്കോടുള്ള പ്രാദേശിക കൃഷി ഗവേഷണ കേന്ദ്രത്തിൽ നടത്തിയ പഠനത്തിൽ കാണുകയുണ്ടായി.

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