Journal of Tropical Agriculture 33 (1995) : 178-180

SEQUENTIAL AND TANK-MIX APPLICATION OF HERBICIDES IN DRY-SOWN RICE

In Kerala, semi-dry system of rice cultivation is practised in most of the rice growing areas during the first crop season (May-June to August-September). In this system, intermittent rains during the early stages cause alternate wetting and drying of soil leading to more than one flush of weeds and resulting in serious weed problems and reduction in yield. As human labour is becoming scarce and costly, herbicides have a great potential for weed control. Among the few herbicides found effective for pre-emergence application in semi-dry rice, thiobencarb and butachlor are the most widely recommended ones (Sankaran and De Datta, 1985). However, studies conducted at the International Rice Research Institute, Philippines have revealed that single application of these pre-emergence herbicides alone will not give satisfactory season-long weed control, as the activity of these chemicals will last only for about a month (IRRI,1980). Hence, post emergence application of propanil around 30 DAS (Singh *el al.,* 1973) or a hand weeding at 40 DAS (Manna and Moorthy, 1982) is recommended. A second application of the same pre-emergence herbicide at a stage when the activity of its previous application is over may result in effective control of the weeds during the entire critical period of weed competition. This trial was taken up to evaluate the feasibility of repeating the application of pre-emergence herbicides as an alternative to combined (tank-mix) or sequential application of pre-emergence and post-emergence herbicides, or a combination of pre-emergence herbicide with a later hand weeding for weed control in dry-sown rice.

A field experiment was laid out in randomised block design with three replications during the first crop season (Virippu) of 1987 at the Agricultural Research Station of the Kerala Agricultural University at Mannuthy. The soil of the experimental site was sandy clay loam with 0.66% organic carbon, 0.138% total N, 32.06 kg ha^{-1} available phosphorus and 172.08 kg ha^{-1} available potassium. There were 15 treatments (Table 1) comprising of application of butachlor and thiobencarb at 1.5 kg ha^{-1} each at zero days and repeated at 20 or 30 days, the basal (0 DAS) application followed either by hand weeding (40 DAS) or post emergence application of propanil 1.5 kg ha^{-1} at 30 DAS and tank-mix application of butachlor or thiobencarb with propanil at early post emergence stage (15 DAS). Efficacy of these treatments were compared with two control treatments vi/.., unweeded and hand weeded (at 21, 40 and 55 DAS). Rice variety Jyothi was raised as per recommendations (KAU, 1993), except that the weed control operations varied with the treatments.

Grasses accounted for the major portion (67%) of the weed flora of the field. The major grass weeds were *Isachne milacea* Roth., *Echinochloa colona* (L.) Link. and *Sacciolepis interrupta* L., *Cyperus iria* L.(sedge) and *Ludwigia parviflora* Roxb. and *Ammania baccifera* Linn. (broad leaved weeds) were the other major weeds.

All weed control treatments significantly reduced the population of weeds and their dry matter production compared to the unweeded control. The hand weeded plot recorded the lowest weed composition. The single basal application of thiobencarb or butachlor alone could not give weed control on par with hand weeding. However, when the basal application of these herbicides was followed up with a second application of the same herbicide at 20 DAS or a hand weeding at 40 DAS, the weed growth could be reduced considerably. Application of propanil alone or in combination with thiobencarb or butachlor could not reduce the weed problems as the above treatments.

Highest grain yield of 36.75 g ha^{-1} was recorded by the hand weeded plot which was about 16 times the yield from the unweeded control. Thiobencarb at 0+20 DAS was the only treatment which gave yield comparable to the hand weeding. The sequential application of butachlor also resulted in significant increase

Table 1. Effect of treatments on weed control and rice yield

Treatments	Weed population at 60 DAS per m^2		Weed drymatter production at 60 DAS g m^{-1}		Grain yield kg ha^{-1}	Straw yield kg ha^{-1}
	t	o	t	o		
To	23.4	549.3	7.9	63,7	2563	6042
To + 20	11.6	152.0	4.4	18.7	3385	7200
To + 30	16.7	312.0	6.2	40.7	2989	5789
To + P30	15.5	253.3	6.3	42.7	2600	6122
To + HW40	10.3	105.3	2.5	5.3	3133	6700
Bo	31.3	1000.0	11.9	140.7	2003	5480
Bo + 20	19.4	388.0	5.6	31.7	2640	5378
Bo + 30	23.0	544.0	8.7	109.0	2300	4844
Bo + P30	19.1	373.3	8.3	75.3	2589	6314
Bo + HW40	11.7	141.3	2.9	7.3	2839	5915
P15	35.3	1249.3	14.4	209.3	715	3300
T15 + P15	24.9	642.7	10.9	136.0	2285	4840
B15 + P15	27.5	757.3	13.7	188.3	1050	4060
HW21 + 40 + 55	2.5	6.7	2.1	3.7	3675	7506
UW	47.2	2289.3	18.5	342.0	232	1177
SEm±	2.88	-	1.52	-	1146	1748
CD (0.05)	8.33	-	4.39	-	3318	5062

t - $\sqrt{x+1}$ transformed value; o - original (retransformed) value; T = Thiobencarb; B - Butachlor; P= Prapanil
HW - Hand weeded; UW = Unweeded
The figures alter T, B, P and HW indicate the days alter sowing when these were given

in the yield over its basal application. Combination of hand weeding at 40 DAS after the basal application of thiobencarb or butachlor also increased the grain yield significantly over the single basal application of thiobencarb or butachlor. The trend was similar for straw yield.

The study indicated that the single basal application of the pre-emergence herbicides thiobencarb or butachlor was not sufficient for effective weed control in dry-sown rice. If the basal application is followed by the same herbicide at 20 DAS or a hand weeding at 40 DAS, effective weed control and better yield could be obtained.

College of Horticulture
Vellanikkara 680 654, Trichur, India

Jolly Chacko Palaikudy
C. T. Abraham

REFERENCES

IRRI, 1980. Herbicide combinations for weed control in dry seeded rain tad rice. Int. Rice Res. Inst. *Annual Report,* 1979. Los Banos, Laguna, Philippines, p. 548

KAU, 1986. ***Package of Practices*** *Recommendations.* Kerala Agricultural University, Directorate of Extension, Trichur, India, p. 239

Manna, G. B. and Moorthy, B. T. S. 1982. Chemical weed control control in upland rice (Kharif 1981). *Annual Report* 1981. Central Rice Research Institute, Cuttack, p. 35-37

Sankaran, S. and De Datta, S. K. 1985. Weeds and weed management in upland rice. *Adv. Aaron.* 38 : 284-337

Singh, M., Singh, R. A. and Sharma, H. *C.* 1973. Six tonnes of food from one hectare dry land. *Indian Fmg* 23(3) : 34-35