

## FUNCTIONAL EFFICIENCY OF PRE-EMERGENCE HERBICIDES IN WET SEEDED RICE

Wet seeding is a promising method of planting rice. Use of chemicals is probably the only feasible method of weed control in wet seeded rice because of the peculiar field condition and absence of rows for hand or rotary weeding (Moody and Cordova, 1985). Several selective pre-emergence herbicides for rice have been developed and used through out the rice growing countries. But in wet seeded rice, as these herbicides are to be applied at the time of seedling emergence and establishment of the crop, they may bring about a higher degree of **phytotoxicity** on rice seedlings. It has been found that the crop selectivity of herbicides can be improved by adding a crop safener to the herbicide (Allard and Zoschke, 1990) or by altering the method of application (Sandhu *et al.*, 1988). Hence the present study was undertaken to find out the functional efficiency of some pre-emergence herbicides in wet seeded rice when applied as sand mixed broadcast compared to spraying.

The experiment was conducted at the Agricultural Research Station, Mannuthy during the second crop season of 1992. The treatments included six pre-emergence herbicides viz., **oxyfluorfen**, **thiobencarb**, butachlor, **anilofos**, **pendimethalin** and pretilachlor + safener, applied either as spray or as sand mixed broadcast, which were compared with hand-weeding twice i.e., at 20 and 40 days after sowing (DAS); and **unweeded** control. The experiment was laid out in randomised block design with three replications. The soil of the experimental site was sandy loam which contained organic carbon 0.67 per cent, available P 87 kg ha<sup>-1</sup> and available K 218.4 kg ha<sup>-1</sup>. **Pre-germinated** seeds of the variety **Jyothi** was sown by broadcast @ 100 kg ha<sup>-1</sup>. The herbicides were applied at 6 DAS both as spray and as sand mixed broadcast. Observations like rice plant population as a measure of **phytotoxicity**, weed count and weed dry matter production were taken using a 0.25 m<sup>2</sup> quadrat.

Sedges and broad leaved weeds constituted the major part of the weed flora with a few

grasses throughout the crop growth period. The predominant weed species were **Schoenoplectus lateriflorus**(Gmel.) Lye among sedges; **Monochoria vaginalis** (Burm. f.) Presl. *ex* **Kunth.** and **Ludwigia perennis** L. among broad leaved weeds.

Data presented in Table 1 indicated that pre-emergence application of pretilachlor + safener as spray resulted in highest plant population which was on par with its application as sand mixed broadcast and **hand-weeding** twice. This showed that among the herbicides tested, pretilachlor + safener is the safest pre-emergence herbicide for wet seeded rice. The higher number of rice plants in the above treatment is evidently due to the lesser **phytotoxic** effect of the herbicide achieved through the crop safener added to it. The lowest plant population was observed in plots sprayed with anilofos followed by those sprayed with **pendimethalin**, indicating the higher phytotoxic effect of these herbicides on rice seedlings under wet seeded situation. The data also showed that in most of the herbicides, application as sand mixed broadcast resulted in numerically higher plant population compared to their respective spray application. This can be attributed to the lesser phytotoxic effect brought about by lesser contact of herbicides with rice seedlings when applied as sand mixed broadcast compared to spraying.

Lowest weed dry matter production was recorded by hand-weeding twice (Table 1). Application of pretilachlor + safener either as spray or as sand mixed broadcast and butachlor as sand mixed broadcast were as effective as hand-weeding twice in reducing the weed dry matter production. This can be attributed to the higher efficiency of pretilachlor + safener in controlling weeds combined with lesser space availability for weed growth due to optimum plant population brought about by the safener added to the herbicide. On the other hand, the highest weed dry matter production was observed in plots where pendimethalin was applied either as spray or as sand mixed broadcast

Table 1. Plant population, weed dry matter production, grain and straw yield of rice as affected by herbicides and their method of application

Sl. No.	Treatments	Plant population per m <sup>2</sup> at 15 DAS	Weed dry matter production per m <sup>2</sup> at 60 DAS, g		Grain yield, kg ha <sup>-1</sup>	Straw yield, kg ha <sup>-1</sup>
			T	O		
1	Oxyfluorfen @ 0.1 kg ha <sup>-1</sup> as spray	70.67	6.95	(65.87)	2746	3111
2	Oxyfluorfen @ 0.1 kg ha <sup>-1</sup> as sand mixed broadcast	107.33	10.21	(114.67)	3222	3601
3	Thiobencarb @ 1.0 kg ha <sup>-1</sup> as spray	52.00	8.38	(73.60)	2587	2759
4	Thiobencarb @ 1.0 kg ha <sup>-1</sup> as sand mixed broadcast	66.67	11.08	(168.67)	3270	3833
5	Butachlor @ 1.25 kg ha <sup>-1</sup> as spray	43.00	8.99	(81.07)	2841	3275
6	Butachlor @ 1.25 kg ha <sup>-1</sup> as sand mixed broadcast	38.33	3.24	(13.20)	2397	3091
7	Anilofos @ 0.4 kg ha <sup>-1</sup> as spray	26.00	15.12	(243.07)	1095	1098
8	Anilofos @ 0.4 kg ha <sup>-1</sup> as sand mixed broadcast	58.33	6.84	(63.73)	2347	3169
9	Pendimethalin @ 1.0 kg ha <sup>-1</sup> as spray	36.67	18.80	(370.40)	1190	1225
10	Pendimethalin @ 1.0 kg ha <sup>-1</sup> as sand mixed broadcast	56.33	17.20	(435.60)	1984	2716
11	Pretilachlor + safener @ 0.4 kg ha <sup>-1</sup> as spray	121.33	5.45	(31.20)	3556	4041
12	Pretilachlor + safener @ 0.4 kg ha <sup>-1</sup> as sand mixed broadcast	106.33	4.52	(24.00)	3222	4276
13	Hand weeding twice (20 and 40 DAS)	97.00	1.50	(1.38)	3619	4056
14	Unweeded control	98.67	12.89	(168.00)	2189	2558
	CD (0.05)	26.31	5.29	-	1427	1261

T -  $\sqrt{(x+1)}$  transformed values ; O - Original values

and in anilofos sprayed plots. This is due to the lesser efficiency of these herbicides in controlling weeds especially *Schoenoplectus lateriflorus* in wet seeded rice combined with more space availability for weed growth brought about by greater phytotoxicity on rice seedlings. The data also indicated that sand mixed application of herbicides was equal or more effective than their respective spray application in reducing the weed dry matter production.

Highest grain yield was obtained from hand-weeded plots (Table 1). Among the herbicides tested, pretilachlor + safener applied as spray or as sand mixed broadcast produced yield increases of 62.4 per cent and 47.2 per cent respectively over unweeded control. This can

be attributed to the reason that the safener added to pretilachlor had protected the rice seedlings with simultaneous herbicidal control over weeds, especially during the critical period of weed competition. Apart from pretilachlor + safener, other herbicides such as Oxyfluorfen, thiobencarb, butachlor and sand mixed application of anilofos also resulted in grain yield on par with hand-weeding twice. However, application of anilofos as spray and pendimethalin either as spray or as sand mixed broadcast resulted in significantly lower yields compared to hand-weeding twice. This is due to the lower plant population as a result of higher phytotoxic effect and higher weed competition due to lesser weed control efficiency of these herbicides. The data also indicated that sand mixed application of herbicides

resulted in an equal or slightly higher grain yield compared to their respective spray application. This showed the equal functional efficiency of pre-emergence herbicides when applied as spray or as sand mixed broadcast, in wet seeded rice.

Highest straw yield was obtained from plots in which pretilachlor + safener was applied as sand mixed broadcast followed by hand-weeding twice and spray application of pretilachlor + safener, once again confirming the superiority of pretilachlor + safener over other herbicides tested. Application of anilofos as

spray and pendimethalin either as spray or as sand mixed broadcast resulted in a significantly lower straw yield compared to hand-weeding twice. The comparable or slightly better efficacy of herbicides applied as sand mixed broadcast over their respective spray application was reflected in straw yield also.

The results indicate that among the herbicides tested, pretilachlor + safener is the safest and effective herbicide for wet weeded rice. EC formulations of pre-emergence herbicides can be effectively applied by mixing with sand instead of spray under such situation.

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