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Evaluation of some promising herbicidal molecules in transplanted summer rice (*Oryza sativa* L.)

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ABSTRACT

A field experiment was conducted in the farmer's field site at Kalyani, West Bengal during summer season of 2002-03 to find out the efficacy of IR 5878 50 WG, a new herbicide molecule, to control the weeds in transplanted summer rice. It was found from the experiment that the new herbicide caused toxicity to the weeds earlier than that by the 2,4 D EE, butachlor, pretilachlor, anilophos. The new herbicide, IR 5878 at 150 g ha^{-1} recorded the highest WCE (57.1%) followed by the traditional herbicides 2,4DEE and anilofos at harvest (53.9%). In the initial stage of the herbicide application in some pockets of the experimental plots particularly where IR 5878 were applied at higher doses (125 or 150 g ha^{-1}) caused stunted growth of paddy and these affected plants recovered within 21 days after application. IR 5878 at125 g ha^{-1} recorded the highest grain yield (8.29 t ha^{-1}) among all the treatments used in this experiment which was 42.2 % more than that recorded from the untreated control, the lowest recorder (5.83 t ha-l) which was closely followed by the treatment, anilofos resulting 40.1 % higher grain yield than the untreated control.

Weed is widely regarded as the major pest of agriculture as it posses serious problems by including severe competitions with crop plants for nutrients, moisture, solar energy and space. Rice suffers forms various constraints in production one of which is the competition through weeds. The loss of yield occurs from 25 to 30% due to unchecked weed growth (Upadhyay and Gogoi, 1993). Hand pulling of weeds is very costly, time consuming and cumbersome process. The only alternative way left with the farmer is to go for chemical weed control or to suffer from severe yield loss. But continuous use of same herbicide or herbicides having the same type of mode of action may lead to resistance in weeds (Malik and Singh, 1993). Hence, the present investigation was undertaken to find out the efficacy of IR 5878 50 WG, a new herbicide molecule, to control the weeds in transplanted summer rice.

MATERIALS AND METHODS

The field experiment was conducted in the farmer's field site at Kalyani, Nadia, West Bengal during summer season' 2002-03. The experimental soil was a typical Gangetic alluvial clay loam soil with a pH of 6.7, organic carbon of 0.66%, total nitrogen of 0.065% and available P_2O_5 and K_2O of 34.6 and 185.3 kg ha^{-1} respectively. The experiment was laid out in randomized block design (RBD) with ten treatments replicated four times with plot size of 5m x 4m. The treatments comprised of five different doses of IR 587850 WG (60,75,100,125, and 150g ha^{-1}), butachlor 50 EC at 1250 g ha^{-1}, 2,4 –D EE 38 EC at 850g ha^{-1}, pretilachlor 50 EC at 500 g ha^{-1}, anilofos 30 EC at 400 g ha^{-1} and weedy check. The crop variety Satabdi (IET 4786) was transplanted in last week of January, 2003 at a spacing of 20cm x l0cm with a uniform dose of 120:60:60 kg ha^{-1} of N,

P_2O_5 and K_2O, respectively. All the herbicides were applied pre-emergence at 3 days after transplanting (DA T) in 2 cm depth of standing water with a spray volume of 600 litre of water per hectare.0.25m^2 quadrate was used to record weed population and their respective dry weight at 25 DAT, 45 DAT and at harvest. Weed control efficiency (WCE) of different weed controlling treatments were computed at harvest stage of the crop based on the dry weight of weeds (Mani *et al.*, 1973).

RESULTS AND DISCUSSION

On weed flora

Brachiaria platyphylla, Commelina benghalensis, Cynodon dactylon, Echinochloa crus-galli, Echinochloa colona and *Leersia hexandra* were dominant among the grassy weeds whereas, *Cyperus difformis, Cyperus iria, Fimbristylis littoralis, and Cyperus arometicus* were the dominant sedges. *Ee/ipta alba, Enhydra jluctuans, Marselia quadrifolia, Cyanotis axillaris, Sphenoe/ea zey/anica, Ludwigia octova/vis* and *Ammania baccifera* showed their dominance among the broad-leaf weeds in the experimental field. Relative composition of weed flora in weedy check plots was 4.1%, 12.4% and 83.5% of grasses, sedges and broad leaf weeds respectively at 25 DAT, 3.8%, 44.9% and 52.3% at 45 DAT and 14.5%, 38.7% and 47.8% at harvest.

Effect on weeds

It was found from the experiment that the new herbicide caused toxicity to the weeds earlier than that by the 2,4 D EE, butachlor, pretilachlor, anilophos. The grassy weed, *Leersia hexandra* and the broadleaf weed, *Cyanotis axillaris* regenerated a few days earlier than that of all other weeds. Pretilachlor, anilofos and butachlor, amongst the standard herbicides, recorded lower population of grasses, sedges and broadleaf weeds. All the standard and tested herbicides recorded lower population of all the weeds than weedy check (Table 1).

Amongst the different herbicides used in this experiment, IR 5878 applied at 125 and 150 g ha^{-1} recorded the lowest weed dry weight at 25 DA T and at harvest respectively, whereas, IR 5878 at 75 g ha^{-1} recorded the same at 45 DAT. Butachlor and anilofos also recorded statistically at par weed dry weight with IR 5878 (Table 2). The new herbicide IR 5878 at 150 g ha^{-1} recorded the highest WCE of 57.1% followed by the traditional herbicides, 2,4-DEE and anilofos at harvest stage (53.9%). The weed control efficiency was gradually increased with the higher dose of the new herbicide IR 5878. Similar type of findings was reported by Ghosh *et al.*, 2003 with the IR 5878 0.5 G.

Effect on crop

Almost no symptoms of phytotoxicity either any chlorotic or necrotic symptoms in leaves or any wilting symptom in paddy plants was found. In the initial stage, in some pockets of the experimental plots particularly where IR 5878 at higher doses (125 or 150 g ha^{-1}) were applied, stunted growth of paddy was observed which recovered within 21days after application (DAA). After 30 DAA, all the paddy plants became good and healthy.

The results indicated that the treatment butachlor and IR 5878 50 at 150 g ha-1 recorded the maximum panicle length (Table 3). This new herbicide along with other herbicides used in this experiment showed the higher number of effective tillers m-2 and number of filled grains panicle-l than that recorded by untreated control.

Table 1 Effect of the treatment on weed population (m^{-2}) at different stages of growth

Treatment	Dose (gha^{-1})	Grass (No. m^2)			Sedge (No. m^2)			Broad leaf (No. m^2)		
		25 DAT	45 DAT	At harvest	25 DAT	45 DAT	At harvest	25 DAT	45 DAT	At harvest
IR 5878	60	6.00	6.50	7.50	0.00	0.00	1.00	5.75	8.00	8.50
IR 5878	75	4.75	4.50	5.00	0.00	0.00	0.00	4.00	10.50	12.75
IR 5878	100	4.50	5.00	5.75	0.25	0.00	0.25	2.50	8.50	10.25
IR 5878	125	3.00	4.50	5.00	0.00	0.00	0.00	2.50	12.25	14.00
IR 5878	150	4.50	4.50	5.25	0.00	0.00	0.00	1.50	5.00	5.25
Butachlor	1250	5.25	4.25	4.50	0.75	7.50	7.25	1.25	2.25	2.50
2,4–D EE	850	3.50	3.25	4.50	0.25	0.00	1.25	1.50	2.50	3.75
Pretilachlor	500	3.25	2.75	2.00	0.50	3.00	3.50	3.0	13.50	4.00
Anilophos	400	4.00	3.75	4.50	0.25	0.25	0.00	1.50	6.75	7.20
Weedy check	-	11.25	10.50	7.50	3.75	17.75	20.00	25.25	20.00	24.25
CD (P=0.05)		0.93	2.65	1.01	0.56	0.59	0.58	1.11	2.82	2.79

The treatment IR 5878 at125 g ha^{-1} recorded the highest grain yield (8.29 t ha^{-1}) among all the treatments closely followed by anilophos which recorded 42.2% and 40.1 % higher grain yield respectively than that recorded from the untreated control, the lowest yield recorder (5.83 t ha^{-1}). All the chemical applied plots did not show any significant differences among themselves in respect of grain yield. In case of straw yield, the highest one was obtained in IR 5878 at 60 g ha^{-1} closely followed by pretilachlor.

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Table 2 Effect of the treatment on weed dry weight (g m^{-2}) at different stages of growth and Weed Control Efficiency (%) at harvest

Treatment	Dose	Dry weight of Weeds (g m^{-2})			Weed control
	(g ha^{-1})	25 DAT	45 DAT	At harvest	Efficiency (%) at Harvest
IR 5878	60	7.54	5.56	8.25	41.5
IR 5878	75	5.83	4.08	7.25	48.6
IR 5878	100	4.63	4.99	7.25	48.6
IR 5878	125	3.78	5.36	7.00	50.4
IR 5878	150	4.16	4.94	6.05	57.1
Butachlor	1250	5.86	6.84	6.90	51.1
2,4-D EE	850	5.30	5.50	6.50	53.9
Pretilachlor	500	5.17	5.79	8.50	39.7
Anilofos	400	4.53	4.39	6.50	53.9
Weedy check	-	9.39	12.00	14.10	-
C D (P=0.05)		3.42	3.24	3.78	-

Table 3 Effect of the treatment on yield parameters and yield of transplanted summer rice

Treatment	Dose (gha^{-1})	No. of effective tillers m^{-2}	Filled grains Panicle^{-1}	Panicle length (cm)	Grain yield t ha^{-1}	Straw yield t ha^{-1}
IR 5878	60	340	66.25	17.99	7.13	7.88
IR 5878	75	351	65.41	19.53	7.25	7.67
IR 5878	100	359	61.66	20.08	7.50	7.13
IR 5878	125	380	66.91	20.74	8.29	7.13
IR 5878	150	386	72.16	20.99	7.58	7.79
Butachlor	1250	346	77.24	20.99	6.70	7.13
2,4–D EE	850	366	67.83	20.45	6.92	7.46
Pretilachlor	500	361	68.49	20.58	7.42	7.83
Anilophos	400	384	64.24	20.28	8.17	7.58
Weedy check	-	320	52.58	17.24	5.83	5.08
CD (P=0.05)		5.06	25.64	2.86	2.15	1.24