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Bio-Efficacy of Quinclorac and Clefoxydim for the Control of Weeds in Rice Nursery

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Abstract

Experiment conducted during the kharif season of 2000 showed that quinclorac at 250 g ai/hectare when applied at 2-4 leaves stage (of weeds) gave the highest weed control efficiency (WCE) of 86.65% with the lowest weed dry matter (1.94 g/m²) at 28 days after sowing (DAS) of rice. It showed no phytotoxicity to rice crop and the germination percentage of rice was also not at all affected (97—98%). Clefoxydim at 100 g ai/hectare recorded the highest WCE (85.41%) at 28 DAS; although lower doses (50—75 g ai/hectare) of this herbicide were also equally effective in controlling the weeds. Clefoxydim also had no negative effect on germination percentage (96—99%) and was non-phytotoxic to rice.

Weed infestation in rice nursery is a serious problem. Weeds compete with rice crop for essential resources, namely, light, moisture nutrients, space and sometimes they act as an alternate host for insect pests and diseases, which ultimately affect health of seedlings for which drastic yield reduction occurs. Hand weeding is time consuming, laborious and uneconomic ; non-availability of sufficient laborers in time also play a key role for disfavoring hand weeding. As rice crop proved highly tolerant to quinclorac (facet SC) (1) this herbicide and clefoxydim (tetris) (2) having good selectivity in rice developed by BASF India Ltd. were evaluated at different rates in comparison to hand weeding and other paddy herbicides (anilophos) for control of weeds in rice nursery.

Methods

The experiment was conducted during the kharif season of 2000 in sandy clay loam soil of Kalyani Seed Farm (23.5°N, 89°E and 9.5m AMSL), Bidhan Chandra Krishi Viswavidyalaya. The experiment was laid out in randomized block design (RBD) with eight treatments and three replications and the plot size was 8 m × 5 m. The treatment combinations were facet SC a new class of highly selective auxin herbicide (3) (quinchlorac 25% SC ; chemical name : 3, 7-dichloro quinoline 8-carboxylic acid) at 125, 187.5 and 250 g ai/hectare and tetris (clefoxydim 7.5% EC ; chemical name 2-[1-(2-(4-chlorophenoxy) propoxyimino)-butyl] 3-oxo-5 thian-3-ylcyclohex-1-enol) at 5 , 75 and 100 g ai/hectare. Other treatments were anilophos at 375 g ai/hectare and unweeded control. Clefoxydim is expected to provide a significant contribution to weed management in rice. First registration for clefoxydim were received in 1998 and registrations in all important rice growing areas of the world are expected (2), The rice variety used in the trial was IET-4786. The herbicides facet SC and tetris were applied at 2—4 leaves stage of the weeds and anilophos was applied at 7 and 15 days after sowing (DAS) of rice. The weed count records were taken at 1 and 3 weeks af-

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ter herbicides application and before uprooting the seedlings for transplanting.

Results and Discussion

Weed Flora Present

The dominant weed flora associated in the experimental rice nursery were *Echinochloa colona, Cynodon dactylon, Digera arvens, Cyperus roturdus.*

Effect on Weeds

All the herbicide treatments significantly controlled the weed population and thereby reduced weed dry weight (g/m²) as compared to the unweeded control treatment. The herbicide facet SC at 250 g ai/hectare gave the lowest weed count (per m²) of 55.74, 16.17 and 11.63 at 721 and 28 DAS respectively (Table 1). Lower dose of facet SC (187.5 g ai/hectare) was also equally effective in reducing weed count. Tetris at 750 g ai/hectare gave statistically at per weed count as compared to the treatment facet at 250 g ai/hectare.

So far as weed dry weight (g/m²) at 7 DAS is concerned, facet SC at 187.5 g ai/hectare gave the lowest weed dry weight (3.98 g/m²). At 21 DAS, tetris at 75 g ai/hectare produced the lowest weed dry matter (2.21 g/m²) which was closely followed by (statistically at per) tetris at 100 g ai/hectare (2.54 g/m²) and facet SC at 250 g ai/hectare (2.58 g/m²). Just before uprooting the seedlings for transplanting, that is, at 28 DAS, facet at 250 g ai/hectare recorded and the lowest weed dry matter (1.94 g/m²), which was statistically at par with the treatments of facet SC at lower doses (125—187.5 g ai/hectare) and all doses of tetris (50—100 g ai/hectare). Similar results were reported earlier also (4) which concluded that weeds in rice nursery can be controlled by spraying quinclorac at 187.5—225 g ai/hectare.

Table 1. Effect of different herbicide treatments on weed count (per m²) and weed dry weight (g/m²) DAS, Days after sowing.

Treatment (g ai/ha)	Weed count/m² on DAS			Weed dry weight (g/m²) on DAS		
	7	21	28	7	21	28
Facet SC 125	57.96	21.27	15.50	5.24	3.07	2.28
Facet SC 187.5	62.54	17.53	13.33	3.98	2.81	2.06
Facet SC 250	55.74	16.17	11.63	4 89	2.58	1.94
Tetris 50	68.18	26.57	16.57	4.82	3.43	2.52
Tetris 75	59.21	21.03	13.53	5.08	2.21	2.14
Tetris 100	64.76	17.30	13 13	4.98	2.54	2.12
Anilophos 375	62.76	21.40	16.30	4.97	2.98	2.30
Unweeded control	72.36	107.77	116.00	5.70	12.64	14.53
CD at 5%	7.45	4.93	5.59	0.66	0.39	0.67

The ability in controlling the grassy weeds by facet SC (quinclorac) might be attributed to complete inhibition of root elongation in susceptible grasses (*Echinochloa* sp.) at 10 μM and at the same concentration, cell wall biosynthesis was reduced by 73% after 6 hours of treatment (5, 6). The selectivity of facet SC as a rice herbicide might be related to the formation of HCN (which causes phytotoxicity) as a co-product during the stimulation of the ethylene biosynthesis caused by the herbicide only in susceptible grasses and not in rice (7).

Effect on Germination of Rice

Except anilophos (at 375 g ai/hectare) all

Table 2. Effect of different herbicide treatments on germination percentage (of rice) and phytotoxicity in rice. DAS, Days after sowing; Y, yellowing; S, scorching.

Treatment (gai/ha)	Germination percentage		Phototoxicity (%) on DAS			
	7	15	21		28	
			Y	S	Y	S
Facet SC 125	84.33	98.00	0	0	0	0
Facet SC 187.5	83.00	96.67	0	0	0	0
Facet SC 250	81.33	98.33	2	0	3	0
Tetris 50	87.67	99.33	0	0	0	0
Tetris 75	82.33	97.33	0	0	0	0
Tetris 100	83.00	96.00	3	0	3	0
Anilophos 375	37.33	40.67	85	40	90	55
Unweeded control	86.00	97.00				
CD at 5%	8.26	4.88				

other herbicides gave satisfactory germination in rice (Table 2). At 7 and 15 DAS the highest germination percentage (87.67 and 99.33 respectively) was observed in the treatment with tetris at 50 g ai/hectare; although all other herbicide treatments (except anilophos) recorded the germination at par with each other.

Phytotoxicity

None of the herbicide other than anilophos tested in this experiment was phytotoxic to rice seedlings as evidenced from the record of no yellowing or scorching of rice seedlings (Table 2). No phytotoxicity was observed in rice seedlings mainly due to non-production of HCN in rice. Similar effect of no phytotoxicity in rice was observed earlier (3). Further studies on the phytotoxicity on rice crop may be conducted using more than 350 g ai/hectare of quinclorac as it was earlier reported (5) that leaf rolling of rice occurred when more than 600 g ai/hectare of quinclorac was applied.

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