

Efficacy of low dose of herbicides against weeds in transplanted *kharif* rice (*Oryza sativa* L.)

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ABSTRACT

Comparative efficacy of penoxsulum 24 SC against weeds in transplanted *kharif* rice was studied at Regional Research Sub-Station (New Alluvial Zone), Bidhan Chandra Krishi Viswavidyalaya, Chakdaha, Nadia, West Bengal. The experiment was laid out in a randomized block design with 7 treatments and 3 replications. The results revealed that the major weed flora associated with the transplanted rice during *kharif* season was mainly comprised of *Echinochloa colona* (30 %), *Cyperus difformis* (20 %), *Monochoria vaginalis* (30 %) and *Ludwigia parviflora* (20 %). Penoxsulam 24 SC at 0.0225 kg a.i. ha⁻¹ applied at 8-12 days after transplanting was most effective to check all types of weed population and their growth. This treatment also gave the maximum grain yield (3.53 tha⁻¹) and straw yield (4.73 tha⁻¹) of rice resulting in lowest weed index (5.61 %). Therefore, penoxsulam 24 SC at 0.0225 kg a.i. ha⁻¹ applied at 8-12 days after transplanting may be recommended to replace the tedious, time consuming and expensive hand weeding practice of weed control in transplanted *kharif* rice.

Keywords: Penoxsulum 24 SC, weeds, transplanted *kharif* rice, yield

Introduction

Rice is the principal crop during rainy season in the plains of West Bengal. The productivity of wet season rice is very low as weeds pose serious menace as compared to other rice ecosystems. This is because of aerobic soil condition, high temperature and dry tillage practice. With the introduction of short statured high yielding rice varieties with erectophylic leaves, the weed menace is becoming more acute (Mishra *et al.* 2006). The weed flora under transplanted condition is very much diverse and consists of grasses, sedges and broad-leaf weeds causing yield reduction of rice crop up to 76% (Singh *et al.* 2004). The effective control of weeds at initial stages (0-40 DAT) can help in improving the productivity of this crop. Therefore, evaluation of new herbicides for control of wide spectrum of weed flora is imperative. Recent trend of herbicide use is to find out an effective weed control measure by using low dose high efficiency herbicides which will not only reduce the total volume of herbicide use but also the application become easier and economic (Kathiresan, 2001). In view of the above facts, the present study was undertaken to evaluate the performance of penoxsulum 24 SC in transplanted *kharif* rice and associated weeds.

Materials and Methods

A field experiment was carried out for two consecutive wet seasons of 2006 and 2007 in new alluvial zone of West Bengal at Regional Research Sub-Station, Chakdaha, Nadia under Bidhan Chandra Krishi Viswavidyalaya. The farm where the experiment was conducted is situated at New Alluvial Zone (NAZ) of West Bengal at 23°5.3' N latitude and 83°5.3' E longitude and 9.75 m above the mean sea level. The land is topographically known as medium land and the soil was sandy clay loam in texture having pH 7.7, EC 0.06 ds m⁻¹, organic carbon 0.67%, available P 16.00 kg ha⁻¹ and available K 126.00 kg ha⁻¹. The experiment was laid out in a randomized block design with 7 treatments (Table 1) and 3 replications. 21 days old seedlings of rice var. IET 4786 (Satabdi) was transplanted with 3-4 seedlings hill⁻¹ during 4th week of July in both the years of experimentation at a spacing of 20 cm × 15 cm. Herbicides were sprayed using knapsack sprayer fitted with a flat fan nozzle at a spray volume of 500 l ha⁻¹. Recommended dose of fertilizers i.e. 60 : 30 : 30 kg N, P₂O₅ and K₂O ha⁻¹ were applied. Half dose of N in the form of Urea, and full amount of P₂O₅ (Single Super Phosphate) and K₂O (Muriate of Potash) were applied as basal during final land preparation.

Rest half of N was topdressed in two equal splits; one at active tillering and the other at panicle initiation stage. Need-based irrigation was given to the crop. The rice plant was harvested on 20.10.2006 and 25.10.2007 during 1st and 2nd year of

experimentation, respectively. The performance of different treatments was studied in terms of all types of flora, weed density, weed biomass and their subsequent effect on growth and yield of rice.

Table 1

Details of treatments

Sl. No.	Treatments	Concentration	Dose (kg a.i. ha ⁻¹)	Time of application (DAT)
T ₁	Butachlor	50 EC	1.50	5-7
T ₂	Penoxsulam	24 SC	0.0225	0-5
T ₃	Penoxsulam	24 SC	0.0250	0-5
T ₄	Penoxsulam	24 SC	0.0200	8-12
T ₅	Penoxsulam	24 SC	0.0225	8-12
T ₆	Hand weeding twice	-	-	20 & 40
T ₇	Non-weeded control	-	-	

DAT, Days after transplanting

Results and Discussion

Effect on weeds

Among the grasses *Echinochloa colona* and *Leersia hexandra*, among the sedges *Cyperus iria* and *Cyperus difformis* and among broad-leaf weeds *Monochoria vaginalis*, *Sagittaria sagittifolia*, *Marsilea quadrifoliata* and *Ludwigia parviflora* were found dominant in the experimental plot during both the years. The weed density was higher during *kharif* season of 2006 than 2007. Density and biomass of weeds were significantly higher in non-weeded control treatment. In contrast, hand weeding (Twice at 20 & 40 DAT) treatment

recorded lower weed density and biomass of weeds than rest of the weed management practices (Table 2). Among the tested herbicides, penoxsulam 24 SC at 0.0225 kg a.i. ha⁻¹ applied at 8-12 days after transplanting (DAT) was most effective to check all types of weed population and their growth resulting in lowest biomass of weeds due to its higher weed control efficiency.

Effect on crop

Perusal of the Table 3 revealed that all the herbicide treated plots produced grain and straw yields significantly more than the non-weeded plots. The highest grain yield of rice (3.74 t

Table 2

Effect of different treatments on weed density, weed biomass and weed control efficiency (Pooled data of two years)

Treatment	Weed density (no. m ⁻²)			Weed biomass (g m ⁻²)			Weed control efficiency (%)		
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
T ₁	18.50	24.25	32.60	8.70	13.00	15.05	45.45	37.19	40.27
T ₂	15.00	23.00	27.50	7.05	11.50	14.15	55.79	44.44	43.84
T ₃	8.55	15.10	20.75	3.80	6.95	11.77	76.17	66.42	53.57
T ₄	16.25	24.50	30.59	7.65	12.15	14.75	52.03	41.30	41.46
T ₅	7.35	13.50	17.25	3.60	6.15	9.50	77.42	70.28	62.30
T ₆	6.10	12.22	15.68	2.20	4.94	7.10	86.20	76.13	71.82
T ₇	34.20	42.00	50.45	15.95	20.70	25.20	0	0	0
S.Em (±)	0.59	0.90	1.21	0.49	0.58	0.50	-	-	-
C.D. (P=0.05)	1.28	1.95	2.62	1.06	1.25	1.08	-	-	-

Table 3
Effect of different treatments on yield of rice (Pooled data of two years)

Treatment	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	% increase of grain yield over control	Weed index (%)
T ₁	2.39	3.21	26.45	36.09
T ₂	2.86	3.77	51.32	23.52
T ₃	3.12	4.19	65.07	16.57
T ₄	3.32	3.59	75.66	11.22
T ₅	3.53	4.73	86.77	5.61
T ₆	3.74	4.95	97.88	0
T ₇	1.89	2.52	0	49.46
S.Em (±)	0.14	0.30	-	-
C.D. (P=0.05)	0.30	0.65	-	-

ha⁻¹) was obtained with hand weeding twice at 20 & 40 DAT and it was at par with penoxsulam 24 SC at 0.0225 kg a.i. ha⁻¹ applied at 8-12 DAT (3.53 t ha⁻¹). Similar trend of result was also found in case of straw yield of rice. Among different tested herbicides, lowest weed index (5.61 %) was recorded with the application of penoxsulam 24 SC at 0.0225 kg a.i. ha⁻¹ (at 8-12 DAT) resulting in 86.77 % increase in grain yield of rice over non-weeded control. The effective control of weeds starting from the early crop growth stage might have resulted in better growth and yield of rice. The variation in grain yield under different treatments was the result of variation in weed density and weed biomass. Application of herbicides under test did not show any phytotoxic symptom on rice plant.

Based on the results of present investigation it can be concluded that penoxsulam 24 SC at 0.0225 kg a.i. ha⁻¹ applied at 8-12 days after transplanting was most effective to check all types of weed population which may be recommended to

replace the tedious, time consuming and expensive hand weeding practice of weed control in transplanted *kharif* rice.

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