

Efficacy of Herbicides against Weeds in Transplanted Wet Season Rice (*Oryza Sativa* L.)

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Abstract: Comparative efficacy of different herbicides against weeds in transplanted kharif rice was studied at Agricultural Farm of Institute of Agriculture, Visva Bharati, Sriniketan, West Bengal. The experiment was laid out in a randomized block design with 9 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*, *Cyperus iria* L., *Sphenoclea zeylanica* Gaertn. and *Ludwigia parviflora* Roxb. Bispyribac sodium @30 g a.i ha⁻¹ applied at 25 days after transplanting was most effective to check all types of weed population and their growth. This treatment also gave the maximum grain yield (5549 kg ha⁻¹) and straw yield (5991 kgha⁻¹) of rice resulting in lowest weed index (5.61 %) among chemical herbicide treated plots. The highest grain and straw yield value as observed with application of bispyribac sodium @ 30 g a.i ha⁻¹ was statistically at par with that of bispyribac sodium @ 25 g a.i ha⁻¹ at 25 DAT. Therefore, bispyribac sodium @ 25 g a.i ha⁻¹ applied at 25 days after transplanting may be recommended for weed management in transplanted kharif rice.

Key Words: Bispyribac sodium, grain yield, transplanted rice.

I. 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 bispyribac sodium 10 WP in transplanted kharif rice and associated weeds.

II. Materials And Methods

A field experiment was carried out in the wet season of 2014 in red and lateritic zone of West Bengal at agricultural farm, Sriniketan, Birbhum under Institute of Agriculture, Visva-Bharati. The farm where the experiment was conducted is situated at red and lateritic zone of West Bengal at The field is situated at 23° 40.167' N latitude and 087° 39.492' E longitudes with an average altitude of 58.9 m above mean sea level. The experimental soil was sandy loam in texture having pH 5.09, EC 0.32ds m⁻¹, organic carbon 0.37%, available N, 157.93 kg ha⁻¹, available P 27.58kg ha⁻¹ and available K 126.41kg ha⁻¹. The experiment was laid out in a randomized block design with 9 treatments (Table 1) and 3 replications. 21 days old seedlings of rice var. MTU 1010 was transplanted with 3-4 seedlings hill⁻¹ during 2nd week of August in the year of experimentation at a spacing of 20 cm × 20 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. 80: 40: 40 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. The rice plant was harvested on 31.10.2014 experimentation. 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	Dose (g a.i. ha ⁻¹)	Time of application (DAT)
T ₁	Bispyribac sodium	20	25
T ₂	Bispyribac sodium	25	25
T ₃	Bispyribac sodium	30	25
T ₄	Cyhalofop-butyl fb2,4 -D	90 fb 800	15 fb 30
T ₅	Cyhalofop-butyl fb MSM+ CME	90 fb 4	15 fb 30
T ₆	Butachlor fb2,4 -D	1500 fb 800	3 fb 30
T ₇	Butachlor fb MSM+ CME	1500 fb 4	3 fb 30
T ₈	Hand weeding twice	-	20 and 40 DAT
T ₉	Weedy check	-	-

fb= followed by, DAT= Days after transplanting, MSM= metsulphuron- methyl, CME= chlorimuron- ethyl.

III. Results And Discussion

Effect on weeds

Among sedges, *Cyperus iria L.*, *Fimbristylis miliacea L.*, among grasses *Cyanodon dactylon Pers.*, *Echinochloa crusgalli (L.) Beauv.*, and among broadleaved weeds *Ludwigia parviflora Roxb.*, *Marsilea quadrifolia L.*, *Sphenoclea zeylanica Gaertn.* and *Alternanthera sessilis L. DC.* were found dominant in the experimental plot during the experimentation. 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, bispyribac-sodium 10 WP at 30 g a.i. ha⁻¹ applied at 25 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. The values of the same were statistically at par with that of bispyribac-sodium 10 WP at 25 g a.i. ha⁻¹ applied at 25 days after transplanting (DAT).

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 (6143 kg ha⁻¹) was obtained with hand weeding twice at 20 & 40 DAT. Among chemical herbicide treated plots bispyribac-sodium 10 WP at 30 g a.i. ha⁻¹ applied at 25 days after transplanting (DAT) recorded highest rice grain yield (5549 kg ha⁻¹) and it was at par with bispyribac-sodium 10 WP at 25 g a.i. ha⁻¹ applied at 25 days after transplanting (DAT) (5176 kg ha⁻¹). Similar trend of result was also found in case of straw yield of rice. The findings are in line with Manjunatha et al., (2012). 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.

Table 2 Effect of different treatments on weed density, weed biomass and weed control efficiency on rice

Treatments	Total weed Density (m ⁻²)		Total weed bio mass (gm ⁻²)		Weed control efficiency (%)	
	40 DAT	60 DAT	40 DAT	60 DAT	40 DAT	60 DAT
T ₁ :- Bispyribac-sodium @ 20 g a.i./ ha at 25 DAT	4.90(23.50)*	5.72(32.25)	1.39(1.44)	2.28(4.70)	93.58	88.71
T ₂ :- Bispyribac-sodium @ 25 g a.i./ ha at 25 DAT	4.50(19.72)	4.90(23.50)	1.30(1.19)	2.20(4.35)	94.67	89.56
T ₃ :- Bispyribac-sodium @ 30 g a.i./ ha at 25 DAT	3.97(15.24)	4.50(19.72)	1.17(0.88)	2.08(3.81)	96.08	90.84
T ₄ :-CFB @90g a.i./ha at 15 DAT fb 2,4-D-Na@ 0.8 kg a.i./ha at 30 DAT	6.56(42.55)	6.56(42.55)	1.68(2.31)	2.61(6.32)	91.84	86.21
T ₅ :-CFB @90g a.i./ha at 15 DAT fb MSM + CME (Almix) @4g a.i./ha at 30 DAT	5.75(32.51)	5.75(32.51)	1.52(1.82)	2.50(5.74)	89.69	84.83
T ₆ :-Butachlor @1.5kg a.i./ha at 3 DAT fb 2,4-D-Na @ 0.8 kg a.i./ha at 30 DAT	7.88(61.52)	7.88(61.52)	1.97(3.36)	3.08(9.02)	89.09	81.91
T ₇ :-Butachlor @1.5kg a.i./ha at 3 DAT fb MSM + CME (Almix) @4g a.i./ha at 30 DAT	7.02(48.83)	7.02(48.83)	1.71(2.42)	2.83(7.53)	84.96	78.31
T ₈ :- Hand weeding at 20, 40 DAT	0.71(0.00)	3.97(15.24)	0.71(0.00)	1.19(0.91)	100.00	97.82
T ₉ :- Weedy check	9.51(89.85)	9.51(89.85)	4.77(22.30)	6.49(41.58)	-	-
LSD (P=0.05)	0.86	0.86	0.25	0.19	NA	NA

*values in parentheses are original. Data transformed to square root transformation. fb= followed by, DAT= Days after transplanting. CFB= cyhalofop-butyl, MSM= metsulphuron- methyl, CME= chlorimuron- ethyl, NA= Not analyzed

Table 3 Effect of different treatments on yield of rice

Treatments	Grain (Kg ha ⁻¹)	Straw(Kg ha ⁻¹)	Weed index (%)
T ₁ :- Bispyribac-sodium @ 20 g a.i./ ha at 25 DAT	4998	5708	13.49
T ₂ :- Bispyribac-sodium @ 25 g a.i./ ha at 25 DAT	5176	5863	10.39
T ₃ :- Bispyribac-sodium @ 30 g a.i./ ha at 25 DAT	5549	5991	3.94
T ₄ :-CFB @90g a.i./ha at 15 DAT fb 2,4-D-Na@ 0.8 kg a.i./ha at 30 DAT	3772	4733	24.25
T ₅ :-CFB @90g a.i./ha at 15 DAT fb MSM + CME (Almix) @4g a.i./ha at 30 DAT	4376	5390	34.71
T ₆ :-Butachlor @1.5kg a.i./ha at 3 DAT fb 2,4-D-Na @ 0.8 kg a.i./ha at 30 DAT	3391	4637	34.97
T ₇ :-Butachlor @1.5kg a.i./ha at 3 DAT fb MSM + CME (Almix) @4g a.i./ha at 30 DAT	3757	4683	41.30
T ₈ :- Hand weeding at 20, 40 DAT	6143	6671	-
T ₉ :- Weedy check	2961	4386	48.74
LSD (P=0.05)	575.57	703.33	NA

fb= followed by, DAT= Days after transplanting. CFB= cyhalofop-butyl, MSM= metsulphuron- methyl, CME= chlorimuron- ethyl, NA= Not analyzed

Based on the results of present investigation it can be concluded that bispyribac-sodium 10 WP at 25 g a.i. ha⁻¹ applied at 25 days after transplanting (DAT) 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 wet season rice.

Reference

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