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DK Debata
Regional Research and Technology
Transfer Station, Odisha
University of Agriculture and
Technology, G Udayagiri,
Kandhamal, Odisha, India

Effect of herbicides in transplanted rice under medium land condition in North Eastern Ghat Zone of Odisha

DK Debata

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Abstract

An experiment was carried out at RRTTS, G Udayagiri, Kandhamal, Odisha during the *Kharif* season of two consecutive years, 2021 and 2022 to study the efficacy of new generation herbicides on density of weed flora, crop yield as well as economics in transplanted rice under medium land condition in North Eastern Ghat zone in Odisha. Weed free treatment recorded significantly the lowest weed dry weight. Among the different herbicides weed management practices, pendimethalin @ 0.75 kg *a.i./ha* fb chlorimuron ethyl + metasulfuron methyl @ 4 g *a.i./ha* recorded significantly lower dry weight of weeds as compared to rest of the herbicidal treated plots but it was at par with pendimethalin @ 0.75 kg *a.i./ha* fb one HW at 20 and 40DAS. In case of weed control efficiency, pendimethalin @ 0.75 kg *a.i./ha* fb chlorimuron ethyl + metasulfuron methyl @ 4 g *a.i./ha* (79.95 kg ha-cm⁻¹) was significantly higher value of weed control efficiency than that rest of the herbicidal treated plots. The higher grain yield was obtained in pendimethalin @ 0.75 kg *a.i./ha* fb chlorimuron ethyl + metasulfuron methyl @ 4 g *a.i./ha* (4.81 t/ha) which was at par with pendimethalin @ 0.75 kg *a.i./ha* fb Bispyribac sodium (20g *a.i./ha*) (4.62 t/ha) and significantly superior to rest of the herbicide treatments. The higher benefit: cost ratio (1.78) was obtained from pendimethalin @ 0.75 kg *a.i./ha* fb chlorimuron ethyl + metasulfuron methyl @ 4 g *a.i./ha*. Overall, the combination of pendimethalin @ 0.75 kg *a.i./ha* fb chlorimuron ethyl + metasulfuron methyl @ 4 g *a.i./ha* is economically profitable (4.81 t/ha) as compared to other chemical treatments for successfully controlling the complex weed flora under transplanted conditions.

Keywords: Herbicide, weed control efficiency, benefit: cost ratio, transplanted rice

Introduction

Rice is life the slogan of the international year of rice 2004 A.D as declared by United Nations General Assembly. Weed infestation is one of the major constraints that reduce yield up to 48% due to weed competition (Duary *et al.* 2015) ^[1]. Therefore, an efficient and economic weed management program is necessary to control different types of weeds throughout the cropping period. The traditional methods like hand weeding though efficient for controlling weeds but it is expensive, time consuming, scarcity of labour and high labour cost during critical period of weed competition and take more time for weeding operation. Hence, usage of herbicides is becoming popular as viable alternative to other weeding methods. However, the continuous use of herbicides with similar mode of action has to be restricted to avoid herbicide resistance in weeds and also weed shift. Keeping this in view, the present study was undertaken to evaluate the bio efficacy of few selective new generation herbicides for the control of weeds in transplanted rice in medium land condition mid central table land zone of Odisha.

Materials and Methods

An field experiment was carried out at RRTTS, G Udayagiri, Kandhamal, Odisha during the *kharif* season of two consecutive years, 2021 and 2022 to study the efficacy of new generation herbicides on density of weed flora, crop yield as well as economics in transplanted rice under medium land condition in mid central table land zone in Odisha. The experiment was laid out in randomized block design with seven treatments such as pendimethalin (0.75kg*a.i./ha*), pendimethalin (0.75kg*a.i./ha*) fb bis pyribac sodium (20g *a.i./ha*), pendimethalin (0.75kg*a.i./ha*) fb ethoxysulphuron (18g *a.i./ha*), pendimethalin (0.75kg*a.i./ha*) fb chlorimuron ethyl + met-sulfuron

Corresponding Author:
DK Debata
Regional Research and Technology
Transfer Station, Odisha
University of Agriculture and
Technology, G Udayagiri,
Kandhamal, Odisha, India

methyl (4g a.i./ha), pendimethalin (0.75kg a.i./ha)fb one HW at 20 and 40DAS, HW at 20,40 and 60 DAS and un weeded check in three replications. Rice variety 'Naveen' was transplanted at 20×10cm spacing. The recommended package of practices was adopted to raise the experimental crop. Herbicides were applied as per treatment at spray volume of 500 l ha⁻¹ using flat nozzle. Data on weed density and dry weight of weeds were recorded at 30 and 60 DAS as well as harvest. Weed samples were air dried before oven drying. Then, they were kept in an oven at 65°C until constant weight was obtained. The data on weed density and dry weight were subjected to square root transformation. The absolute effect of particular herbicide in reducing the weed competitions and increasing crop productivity were measured effectively by weed control efficiency as per Walia (2003) [4]. Weed control efficiency was calculated on the basis of dry weight of weeds

About 5 - 55% of all women suffer from breast disorders in their lifetime. Benign disorders of the breast is usually seen in reproductive period of life, is thought to be largely hormone induced and there is a dramatic fall in the incidence, after menopause due to cessation of clinical ovarian stimulation. Benign breast disease is 4 -5 times more common than breast cancer [3].

The concept of ANDI – Abberations of Normal Development and Involution is gaining acceptance [4]. Benign proliferation of the breast are often considered as aberrations of normal development and involution. The cyclical changes due to variations in estrogen and progesterone result in increased mitosis around days 22–24 of the menstrual cycle but apoptosis restores the balance across the cycle. ANDI, first proposed by Huges is now universally accepted. This concept allows conditions of the breast to be mapped between normality, through benign.

Weed control efficiency was calculated on the basis of dry weight of weeds

$$WCE = \frac{DW_c - DW_t}{DW_c} \times 100$$

Where,

WCE = Weed control efficiency, DW_c = Average dry weight of weed per unit area in the control plot and DW_t = Average dry weight of weed per unit area in the treated plot. The higher value of WCI means better is the efficiency of treatment and vice versa. Yield and yield attributes of rice were recorded at harvest stage. From the pooled data, economics was worked out on the basis of prevailing market price of the produce and inputs used in the experiment. The pooled analysis of the recorded data for various parameters were carried out using the procedures

described by Gomez and Gomez (1984) [2].

Results and Discussion

Weed flora: The major weed flora infesting the experimental field included *Cynodon dactylon*, *Echinochloa colonum*, *Echinochloa crus-galli* and *Leptochloa chinensis* among grasses *Fimbristylis miliaceae*, *Cyperus difformis*, *Cyperus iria*, *Cyperus rotundus* and *Fimbristylis miliaceae* among sedges and *Monochoria vaginalis*, *Ludwigia spp.*, *Sphenoclea zeylanica*, *Ammania bacifera*, *Eclipta alba* and *Commelina benghalensis* among broadleaf weeds.

Effect on weeds: Among the different herbicide management practices, the result showed (Table 1) hat pendimethalin @ 0.75 kg a.i./ha fb chlorimuron ethyl + metasulfuron methyl @ 4 g a.i./ha corded lower dry weight of weeds, which was at par with pendimethalin @ 0.75 kg a.i./ha fb one HW at 20 and 40DAS and significantly lower to rest of the herbicidal treated plots. In respect to weed control efficiency, pendimethalin @ 0.75 kg a.i./ha fb chlorimuron ethyl + metasulfuron methyl @ 4 g a.i./ha (79.95 kg ha-cm⁻¹) was significantly higher value of weed control efficiency than that rest of the herbicidal treated plots

Effect on crop: Among the different herbicide weed management practices, the result indicated that (Table-1) pendimethalin @ 0.75 kg a.i./ha fb chlorimuron ethyl + metasulfuron methyl @ 4 g a.i./ha corded higher yield attributing characters such as panicle /m², filled grains panicle⁻¹ and test weight. The higher grain yield was obtained in pendimethalin @ 0.75 kg a.i./ha fb chlorimuron ethyl + metasulfuron methyl @ 4 g a.i./ha (4.81 t/ha) which was at par with pendimethalin @ 0.75 kg a.i./ha fb Bispyribac sodium (20g a.i./ha) (4.62 t /ha) and significantly superior to rest of the herbicide treatments. The higher benefit: cost ratio (1.78) was obtained from pendimethalin @ 0.75 kg a.i./ha fb chlorimuron ethyl + metasulfuron methyl @ 4 g a.i./ha. These results are in harmony with findings of Prakash *et al.* (2017). They suggested that herbicide combination like Pretilachlor fb. Chlorimuron ethyl + metasulfuron methyl was found to be economically significantly higher grain yield among the different herbicide combination.

Economics: The maximum benefit: cost ratio (1.78) was obtained (Table 1) from pendimethalin @ 0.75 kg a.i./ha fb chlorimuron ethyl + metasulfuron methyl @ 4 g a.i./ha treated plot followed by Pendimethalin @ 0.75 kg a.i./ha fb Bispyribac sodium (20g a.i./ha). It might be due to higher grain yield with low cost of cultivation.

Table 1: Effect of weed management practices on grain yield and weed control efficiency in transplanted rice (pooled mean).

	Effective panicles/m ²	No of Grains/ panicle	Test weight (g)	Grain yield (t/ha)	Weed dry matter(g/m ²)			WCE (%)	B:C Ratio
					30DAS	60DAS	At harvest		
Pendimethalin @ 0.75 kg a.i./ha	232.00	96.25	24.51	3.80	3.81 [14.5]	5.68 [32.24]	6.87 [47.20]	57.67	1.42
Pendimethalin @ 0.75 kg a.i./ha fb Bispyribac sodium (20g a.i./ha)	259.00	100.15	25.43	4.62	2.78 [7.71]	4.69 [21.97]	5.71 [32.61]	71.46	1.65
Pendimethalin @ 0.75 kg a.i./ha fb Ethoxysulfon (18g a.i./ha)	244.00	104.60	25.62	4.21	2.81 [7.9]	4.79 [22.91]	6.37 [40.61]	64.45	1.57
Pendimethalin @ 0.75 kg a.i./ha fb Chlorimuron ethyl + Metasulfuron methyl @ 4 g a.i./ha)	273.00	105.07	25.83	4.81	2.64 [6.99]	3.60 [12.99]	4.79 [22.91]	79.95	1.78
Pendimethalin @ 0.75 kg a.i./ha fb two hand weeding's at 20 and 40DAS	260.33	103.72	25.53	4.49	3.07 [9.46]	4.09 [16.77]	5.38 [28.95]	74.66	1.54
Hand weeding at 20, 40 and 60 DAS	273.33	113.00	26.00	4.92	2.34	2.57	3.7	88.00	1.48

					[5.5]	[6.59]	[13.70]		
Control (No weeding)	111.67	79.23	23.13	2.63	7.14 [50.94]	9.19 [84.53]	10.69 [114.29]	-	0.94
CD (P=0.05)	23.95	6.84	1.57	0.30	0.14	0.11	0.14	1.32	-

Figure in the parentheses are the original values, DAS-Days after sowing

Conclusion

Overall, the combination of pendimethalin @ 0.75 kg *a.i./ha* fb chlorimuron ethyl + metasulfuron methyl @ 4 g *a.i./ha* is economically profitable (4.81 t/ha) as compared to other chemical treatments for successfully controlling the complex weed flora under transplanted conditions.

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