



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
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www.agronomyjournals.com
2018; 1(1): 19-21
Received: 20-02-2018
Accepted: 24-03-2018

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Effect of herbicides on mixed weed flora and economics of direct seeded rice (*Oryza sativa* L.)

Abhilash Kujur, AP Singh and Anjum Ahmad

Abstract

The present experiment was conducted at Instructional cum Research Farm, Department of Agronomy, IGKV, Raipur (C.G.) during *Kharif* season 2013 to find out the most effective weed management in direct seeded Rice. The eleven different weed management practices were laid out in Randomized Block Design (RBD) with three replications. Rice variety "MTU-1010" was grown as a test crop. Rice was sown on 20th June, 2013 with a spacing of 20 cm (row to row). The crop was fertilized with 100, 60 and 40 kg N, P₂O₅ and K₂O ha⁻¹, respectively. The results of experiment indicated that lower weed density and dry matter accumulation at initial period of crop growth responded significantly better to oxadiargyl @ 100 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 25 DAS (T₃) and this was followed by pyrazosulfuron @ 20 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 25 DAS (T₄). At later period of growth, lower weed density and dry matter accumulation under pendimethalin @ 1000 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 21 DAS followed by hand weeding at 45 DAS (T₅) favoured significant enhancement in number of effective tillers, weed index, straw and grain yield. The experimental field dominated by mainly *Echinochloa colona*, *Alternanthera triandra*, *Cyperus iria*, *Spilanthus acmella*, *Cyanotis axillaris* throughout the crop season. It was also observed that all the herbicide treatments were effective and significantly enhanced the grain yield over control.

Keywords: Rice, oxadiargyl, bispyribac sodium, pyrazosulfuron, pendimethalin, weed

Introduction

Rice (*Oryza sativa* L.), is considered as a major cereal, which can be viewed from the fact that it occupies 11 per cent of world's crop area. Rice is a staple food for more than 60% of the world population, especially in South and South-east Asia and Latin America. Direct seeding of rice refers to the process of establishing the crop from seeds sown in the field rather than by transplanting seedlings from the nursery. Weeds are most serious biological constraints in direct seeded rice, because weed emergence coincide with the seedlings due to which the productivity is often lower. Rice grain production in India suffers a yearly loss of 15 million tonnes due to weed competition. Chemical weed control is regarded to be better than hand weeding due to drudgery involved in weeding and unavailability of labour at peak period of weed infestation. In this respect, application of new and wide spectrum herbicide alone or in combination may give satisfactory weed control.

Materials and Methods

The present experiment was conducted at Instructional cum Research Farm, Department of Agronomy, IGKV, Raipur (C.G.) during *Kharif* season (June to October) of 2013 to find out the most effective weed management method in direct seeded Rice. The eleven different weed management practices were laid out in Randomized Block Design (RBD) with three replications. Rice variety "MTU-1010" was grown as a test crop. Rice was sown on 20th June, 2013 with a spacing of 20 cm (row to row) and was harvested in third week of October. The crop was fertilized with 100, 60 and 40 kg N, P₂O₅ and K₂O ha⁻¹, respectively.

Results and discussion

The predominant weeds in experimental field were *Echinochloa colona*, *Alternanthera triandra*, *Cyperus iria*, *Spilanthus acmella*, *Cyanotis axillaris* throughout the crop season. The results of experiment indicated that lower weed density and dry matter accumulation at initial period of

crop growth responded significantly better to oxadiargyl @ 100 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 25 DAS (T₃) and this was followed by pyrazosulfuron @ 20 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 25 DAS (T₄). At later period of growth, lower weed density and dry matter accumulation under pendimethalin @ 1000 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 21 DAS followed by hand weeding at 45 DAS (T₅) favoured significant enhancement in number of effective tillers, weed index, straw and grain yield. Timely and effective control of weeds with integrated use of pre-and post-emergence herbicides resulted in increased yield components, which ultimately reflect on grain

yield. Similar result was found by Walia *et al.* (2008) [15] and Yadav *et al.* (2011) [17]. Among different weed management practices, higher gross return (Rs. 73,876 ha⁻¹) and net return (Rs. 49,516 ha⁻¹) was obtained under pendimethalin @ 1000 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 21 DAS followed by HW at 45 DAS. However highest B: C (2.24) ratio was obtained under oxadiargyl @100 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 25 DAS Gowda (2009) was of the similar views. Maximum (154.35 MJ × 10⁻³ ha⁻¹) net energy output was recorded at pendimethalin @ 1000 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 21 DAS followed by hand weeding at 45 DAS (T₅).

Table 1: Effect of different weed management practices on weed density and dry matter of total weeds at various intervals

Treatment	Weed density (No.m ⁻²)	Dry matter (g m ⁻²)
	At harvest	At harvest
T ₁ : Bispyribac sodium @ 25 g ha ⁻¹ at 21 DAS	10.09 (101.34)	10.34 (9.89)
T ₂ : Pendimethalin* @ 1000 g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 25DAS	8.03 (64.0)	7.42 (54.6)
T ₃ : Oxadiargyl 100 @ g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 25 DAS	6.46 (41.33)	6.47 (41.4)
T ₄ : Pyrazosulfuron @ 20 g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 25 DAS	5.70 (32.0)	6.57 (42.7)
T ₅ : Pendimethalin* @ 1000 g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 21 DAS fb HW at 45 DAS	3.89 (14.67)	4.48 (24.4)
T ₆ : Pendimethalin* @ 1000 g ha ⁻¹ at 2 DAS fb HW at 26 DAS	6.46 (41.33)	6.79 (45.7)
T ₇ : Bispyribac sodium @ 20 g ha ⁻¹ + (CME + MSM) @ 4 g ha ⁻¹ at 21 DAS	6.57 (42.67)	6.14 (37.2)
T ₈ : Azimsulfuron @ 35 g ha ⁻¹ at 21 DAS	8.35 (69.34)	8.8 (77.0)
T ₉ : Mechanical weeding at 20,40 and 60 DAS	9.47 (89.34)	10.17 (103.0)
T ₁₀ : HW at 20,40 and 60 DAS	4.22 (17.33)	5.04 (25.0)
T ₁₁ : Unweeded control	14.42 (207.57)	14.72 (216.3)
SEm ± CD(P=0.05)	0.56	0.37
	1.68	1.10

CME+MSM = Chlorimuron ethyl + Metsulfuron methyl; DAS = Days after sowing; fb = followed by; HW = Hand weeding;

* Pendimethalin (stomp xtra 38.7% CS); Original data are given in parenthesis.

Without yield mentioned how can it possible analyze of B:C ratio

Table 2: Economics of direct seeded rice as influenced by various weed management practices

Treatment	Total cost of cultivation (Rs. ha ⁻¹)	Gross return (Rs. ha ⁻¹)	Net return (Rs. ha ⁻¹)	Benefit cost ratio (Rs. ha ⁻¹)
T ₁ : Bispyribac sodium @ 25 g ha ⁻¹ at 21DAS	21355	61387	40032	1.87
T ₂ : Pendimethalin* @ 1000 g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 25 DAS	22530	71983	49453	2.19
T ₃ : Oxadiargyl @100 g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 25 DAS	22005	71308	49303	2.24
T ₄ : Pyrazosulfuron @ 20 g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 25 DAS	21818	66383	44565	2.04
T ₅ : Pendimethalin* @ 1000 g ha ⁻¹ at 2 DAS fb bispyribac sodium @ 25 g ha ⁻¹ at 21 DAS fb HW at 45 DAS	24360	73876	49516	2.03
T ₆ : Pendimethalin* @ 1000 g ha ⁻¹ at 2 DAS fb HW at 26 DAS	23700	65708	42008	1.77
T ₇ : Bispyribac sodium @ 20 g ha ⁻¹ + (CME + MSM) @ 4 g ha ⁻¹ at 21 DAS	21680	59670	37990	1.75
T ₈ : Azimsulfuron @ 35 g ha ⁻¹ at 21 DAS	22155	65495	43340	1.96
T ₉ : Mechanical weeding at 20,40 and 60 DAS	20878	62123	41245	1.98
T ₁₀ : HW at 20,40 and 60 DAS	30760	69556	38796	1.26
T ₁₁ : Unweeded control	19780	13389	---	---

CME+MSM = Chlorimuron ethyl + Metsulfuron methyl; DAS = Days after sowing; fb = followed by; HW = Hand weeding; * Pendimethalin (stomp xtra 38.7% CS)

Conclusion

On the basis of results obtained, it was concluded that oxadiargyl @ 100 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 25 DAS (T₃) followed by pyrazosulfuron @ 20 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 25 DAS (T₄) were effective at initial stage (at 20 DAS) of rice growth but in later stages (60 DAS and at harvest) pendimethalin @ 1000 g ha⁻¹ at 2 DAS followed by bispyribac sodium @ 25 g ha⁻¹ at 21 DAS followed by hand weeding at 45 DAS (T₅) were found equally effective to control the broad spectrum weeds in direct seeded rice. Also its application proved best with respect to rice production (maximum rice yield 5.16 t ha⁻¹). The maximum total cost of cultivation (Rs. 30,760.00 ha⁻¹) was recorded under HW at 20, 40 and 60 DAS (T₁₀).

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