



Effect of sequential application of herbicides on weed flora and grain yield in direct seeded rice (*Oryza sativa* L.)

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ABSTRACT

An experiment was conducted during the two consecutive seasons of Kharif 2015 and Kharif 2016 in the silty loam soil at Agronomy Research Farm of N.D.U.A.T., Kumarganj, Faizabad, (UP). The experiment was conducted in Randomized Block Design which comprised of ten treatment combinations viz T₁ - Pendimethalin (PRE) fb Bispyribac - Na (POE) (1000 fb 25g ha⁻¹), T₂ - Oxadiargyl (PRE) fb Bispyribac - Na (POE) (100 fb 25 ha⁻¹), T₃ - Pendimethalin (PRE) fb Fenoxaprop (POE) (1000 fb 67 ha⁻¹), T₄ - Oxadiargyl (PRE) fb Fenoxaprop (POE) (100 fb 60 ha⁻¹), T₅ - Pendimethalin (PRE) fb 2, 4-D Na (POE) (1000 fb 60 ha⁻¹), T₆ - Butachlor (PRE) fb Bispyribac Na (POE) (1500 fb 25 ha⁻¹), T₇ - Butachlor (PRE) fb 2, 4 -D Na (POE) (1500 fb 60 ha⁻¹), T₈ - Butachlor (PRE) fb Fenoxaprop (POE) (1500 fb 67 ha⁻¹), T₉ - Weed free (25 and 45 DAS) and T₁₀ - Weedy check (PRE and POE application at 3 DAS and 25 DAS). Rice variety 'NDR-359' was seeded in rows spacing 20 cm apart using seed drill. Results reveals that at 60 DAS, among the weed management practices, Pendimethalin (PRE) 1.0 kg ha⁻¹ fb bispyribac-Na (POE) 0.025 kg ha⁻¹ (4.25) was recorded significantly lower weed density which was at par with T₂ and T₆ while significant as compare to rest of the herbicide treatment. Significantly superior weed management under weed free plots were recorded as comparison to overall treatments with weedy check. Higher weed control efficiency was recorded under treatment with Pendimethalin (PRE) 1.0 kg ha⁻¹ fb bispyribac-Na (POE) 0.025 kg ha⁻¹ (62.46 %) followed by T₂ (61.22 %) and T₆ (59.89 %) as compare to rest of the herbicidal treatment while its highest value were recorded in weed free treatment. The significantly maximum grain yield was found in Pendimethalin (PRE) 1.0 kg ha⁻¹ fb bispyribac - Na (POE) 0.025 kg ha⁻¹ (3.83 q ha⁻¹) which was at par with T₂, T₅ and T₆ as compared to rest herbicidal treatment while treatment T₇ and T₃ recorded significantly higher value over T₄, T₈ and weedy check. Significantly highest grain yield was found in weed free plots. Consequently, the highest benefit : cost ratio were recorded under Pendimethalin (PRE) 1.0 kg ha⁻¹ fb bispyribac - Na (POE) 0.025 kg ha⁻¹ (Rs. 1.77 per Re. invested) followed by T₂ and T₆. Lowest benefit cost ratio were found in weed free and weedy check.

Keywords: DSR, Pre emergence, Post emergence, Herbicides, B:C ratio, WCE.

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INTRODUCTION

Rice is the staple food crop of India. It is grown in an area of 43.95 million ha with total production of 104.32 million tonnes and with an average productivity of 2.40 t ha⁻¹. Uttar Pradesh ranks 2nd in total rice production. Weed infestation is the major constraints in direct seeded rice causing severe yield losses. Success adoption of direct seeded rice (DSR) depends largely on weed control especially with chemical methods as mechanical weed control is labour intensive and not cost effective. Various herbicides have been used for controlling weeds in DSR but efficiency of chemical methods based on single herbicide treatment may be non significant because of their narrow spectrum of weed control. Application of several herbicides in sequence can be more useful (Chauhan and Yadav 2013). Hence keeping above facts in view the present investigation was under taken.

METHODOLOGY

An experiment was conducted during the two seasons of Kharif 2015 and Kharif 2016 at Agronomy Research Farm of N.D.U.A.T., Kumarganj, Faizabad, (UP). The experiment was conducted in Randomized Block Design and replicated three times. The experiment comprised of ten treatment combinations viz T₁ - Pendimethalin (PRE) fb Bispyribac - Na (POE) (1000 fb 25g ha⁻¹), T₂ - Oxadiargyl (PRE) fb Bispyribac - Na (POE) (100 fb 25 ha⁻¹), T₃ - Pendimethalin (PRE) fb Fenoxaprop (POE) (1000 fb 67 ha⁻¹), T₄ -

Oxadiazargyl (PRE) *fb* Fenoxaprop (POE) (100 *fb* 60 ha⁻¹), T₅ - Pendimethalin (PRE) *fb* 2, 4-D Na (POE) (1000 *fb* 60 ha⁻¹), T₆ - Butachlor (PRE) *fb* Bispyribac Na (POE) (1500 *fb* 25 ha⁻¹), T₇ - Butachlor (PRE) *fb* 2, 4 -D Na (POE) (1500 *fb* 60 ha⁻¹), T₈ - Butachlor (PRE) *fb* Fenoxaprop (POE) (1500 *fb* 67 ha⁻¹), T₉ - Weed free (25 and 45 DAS) and T₁₀. Weedy check (PRE and POE application at 3 DAS and 25 DAS). The soil was silty loam in texture having pH 7.8. Rice variety 'NDR-359' was seeded in rows spacing 20 cm apart using seed drill. Weed density (no. m⁻²) were recorded species wise in each plot using quadrates of 50 x 50 cm (0.25 m²) from the area selected randomly for observations.

RESULTS AND DISCUSSION

At 60 DAS, among the weed management practices, Pendimethalin (PRE) 1.0 kg ha⁻¹ *fb* bispyribac-Na (POE) 0.025 kg ha⁻¹ (4.25) was recorded significantly lower weed density which was at par with T₂ and T₆ while significant as compare to rest of the herbicide treatment. Significantly superior weed management under weed free plots were recorded as comparison to overall treatments with weedy check (Table-1). Higher weed control efficiency was recorded under treatment with Pendimethalin (PRE) 1.0 kg ha⁻¹ *fb* bispyribac-Na (POE) 0.025 kg ha⁻¹ (62.46 %) followed by T₂ (61.22 %) and T₆ (59.89 %) as compare to rest of the herbicidal treatment while its highest value were recorded in weed free treatment (Table-1). The significantly maximum grain yield was found in Pendimethalin (PRE) 1.0 kg ha⁻¹ *fb* bispyribac - Na (POE) 0.025 kg ha⁻¹ (3.83 q ha⁻¹) which was at par with T₂, T₅ and T₆ as compared to rest herbicidal treatment while treatment T₇ and T₃ recorded significantly higher value over T₄, T₈ and weedy check. Significantly highest grain yield was found in weed free plots (Chauhan and Yadav, 2013). Consequently, the highest benefit : cost ratio were recorded under Pendimethalin (PRE) 1.0 kg ha⁻¹ *fb* bispyribac - Na (POE) 0.025 kg ha⁻¹ (Rs. 1.77 per Re. invested) followed by T₂ and T₆. Lowest benefit cost ratio were found in weed free and weedy check due to high labour intensity and maximum weed infestation in DSR. Similar results were found by Singh et al., 2003.

Table - 1. Effect of sequential application of herbicide on weed flora and grain yield in Direct seeded Rice (averaged over two years).

Treatments	Dose g ha ⁻¹	Weed density m ⁻² at 60 DAS	WCE (%)	Grain yield (q ha ⁻¹)	B:C ratio
T ₁ Pendimethalin (PRE) <i>fb</i> bispyribac-Na (POE)	1000 <i>fb</i> 25	4.25 (17.10)	62.46	3.94	1.77
T ₂ Oxadiazargyl (PRE) <i>fb</i> bispyribac-Na (POE)	100 <i>fb</i> 25	4.39 (18.24)	61.22	3.81	1.69
T ₃ Pendimethalin (PRE) <i>fb</i> fenoxaprop (POE)	1000 <i>fb</i> 67	5.48 (29.01)	51.59	3.21	1.41
T ₄ Oxadiazargyl (PRE) <i>fb</i> fenoxaprop (POE)	100 <i>fb</i> 60	6.20 (37.48)	45.23	2.89	1.36
T ₅ Pendimethalin (PRE) <i>fb</i> 2, 4-D Na (POE)	1000 <i>fb</i> 60	4.78 (21.83)	57.77	3.68	1.48
T ₆ Butachlor (PRE) <i>fb</i> Bispyribac Na (POE)	1500 <i>fb</i> 25	4.54 (19.58)	59.89	3.75	1.52
T ₇ Butachlor (PRE) <i>fb</i> 2, 4 -D Na (POE)	1500 <i>fb</i> 60	5.44 (28.58)	51.94	3.54	1.44
T ₈ Butachlor (PRE) <i>fb</i> fenoxaprop (POE)	1500 <i>fb</i> 67	5.63 (30.77)	50.26	2.91	1.38
T ₉ weed free	25 and 45 DAS	0.00	100	4.09	0.89
T ₁₀ Weedy check	-	11.32 (123.66)	0.00	1.51	0.27
SEm±	-	0.11	-	0.13	-
LSD (P=0.05)	-	0.32	-	0.42	-

Values in parentheses are original. Data transformed to square root transformation

CONCLUSIONS

On the basis of summarized results it may be concluded that sequential application of PRE and POE emergence herbicide of, Pendimethalin (PRE) 1.0 kg ha⁻¹ (3 DAS) *fb* bispyribac - Na (POE) 0.025 kg ha⁻¹ (25 DAS) was most effective for controlling weeds, improving grain yield and profitability of DSR.

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