



RESEARCH PAPER

Residual effect of almix herbicide applied to direct seeded upland rice on succeeding toria under Tripura condition

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Abstract : The field experiment was conducted to assess the residual effect of herbicide applied to direct seeded rice on toria grown at KVK, South Tripura. The experiment consisted of twelve treatments laid out in Randomized Complete Block Design with three replications. Total six numbers of herbicides viz., pendimethalin, 2,4-D, fenoxaprop, bispyribac sodium, metsulfuron methyl+chlorimuron ethyl (Almix), pyrazosulfuron ethyl was applied alone or integrated with other herbicides or different weed management practices. Among the various herbicide tested in direct seeded upland rice metsulfuron methyl + chlorimuron ethyl (Almix) had exerted residual effect on toria and the effect was evident from poor growth, yield and yield attributing characters of toria. Other herbicide had no residual effect on succeeding toria after rice.

Key Words : Residual effect, Fenoxaprop, Weed management, Almix, Pendimethalin

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INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most extensively grown cereal crops of the world. In recent years, there has been a shift from transplanted rice to direct-seeded rice (DSR) cultivation in several countries of South East Asia (Pandey and Velasco, 2002). At present, 23 per cent of rice is direct-seeded globally (Rao *et al.*, 2007). Heavy weed infestation is one of the major constraints in DSR causing severe yield losses which is the major bottleneck in DSR cultivation especially in dry field conditions (Harada *et al.*, 1996 and Rao *et al.*, 2007). Yield losses due to weeds varied from 40-100 per cent in direct-seeded rice (Choubey *et al.*, 2001). Most of the herbicides recommended for DSR are applied as

pre-emergence to control weeds during initial period, however, a few post emergence herbicides may be more effective to control various flushes of weeds in DSR. But the herbicides used in rice sometimes lead to residual effect on succeeding crop or next crop. Hence, the present investigation is made to see the residual effect of herbicides applied to direct seeded upland rice to succeeding toria.

MATERIAL AND METHODS

A field experiment was conducted at Krishi Vigyan Kendra, South Tripura during the *Kharif* (wet) season of 2013 and 2014 to evaluate the residual effect of different herbicides applied to direct seeded upland rice

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on succeeding toria. Twelve treatments *viz.*, T₁ (Pendimethalin at 1.0 kg ha⁻¹ at 2 DAS), T₂ (Bispyribac sodium at 25 g ha⁻¹ at 25 DAS), T₃ (Pendimethalin at 1.0 kg ha⁻¹ at 2 DAS+ one hand weeding at 30 DAS), T₄ (Pendimethalin at 1.0 kg ha⁻¹ at 2 DAS + bispyribac sodium at 25 g ha⁻¹ at 20 DAS), T₅ (Metsulfuron methyl+ chlorimuron ethyl (Almix) at 4 g at 10 DAS followed by Bispyribac sodium at 25 g at 20 DAS), T₆ (Pyrazosulfuron ethyl at 25 g ha⁻¹ at 3 DAS followed by bispyribac sodium at 25 g at 20 DAS), T₇ (Fenoxaprop-p-ethyl at 60 g ha⁻¹ + metsulfuron methyl+ chlorimuron ethyl (Almix) at 4 g ha⁻¹ at 15 DAS), T₈ (Stale seed bed + smother crop (cowpea) in between two rows of rice), T₉ (Stale seed bed + one hand weeding at 30 DAS), T₁₀ (Sesbania (broadcast) @ 25 kg ha⁻¹ during sowing of rice + 2,4-D at 500 g ha⁻¹ at 25 DAS), T₁₁ (Hand weeding at 15, 30 and 45 DAS), T₁₂ (Weedy check) were assigned in a Randomized Block Design replicated thrice. Rice variety NDR-97 and toria var. TRC toria 1-1-5-1 was used for the experimental purpose with recommended package of practices.

The upland rice was fertilized as per package of practices recommended. Five tonnes of farm yard manure was applied at the time of field preparation for both the crop. Chemical fertilizers were applied to meet 60 kg nitrogen in the form of urea, 40 kg phosphorus in the form of single superphosphate and 40 kg potassium in the form of muriate of potash in case of rice and in case of toria the dose was 50:30:30 kg NPK ha⁻¹.

To see the residual effect of herbicide applied in rice on succeeding toria, growth, yield and yield attributing characters of toria was studied. The data generated from the experiment were subject to analysis of variance (ANOVA) as applied to Randomized Block Design describe by Cochran and Cox (1965).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect on growth characters of toria :

The data presented in the Table 1 revealed that the plant population and growth characters of toria were significantly influenced by the treatments applied in rice. Among the various treatments applied in rice, metsulfuron + chlorimuron (Almix) at 4 g at 10 DAS followed by bispyribac sodium at 25 g at 20 DAS (T₅) and fenoxaprop at 60 g ha⁻¹ + metsulfuron + chlorimuron (Almix) at 4 g ha⁻¹ at 15 DAS (T₇) exerted residual effect on succeeding toria as resulting in the lowest plant population, plant height and lowest number of branches in both the years. All other treatments were at par with each other (Table 1). No harmful effect on toria was observed in the plots treated with bispyribac sodium and these observations suggested that almix had residual effect on succeeding toria.

Table 1 : Effect of treatments on plant population and growth of toria

Treatments	Plant population (No. m ⁻²)		Plant height (cm)		No. of branches plant ⁻¹	
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
T ₁	26.67	26.67	98.33	91.33	11.32	9.30
T ₂	28.00	26.00	94.33	90.00	11.33	9.45
T ₃	28.00	28.00	99.67	90.33	11.47	9.48
T ₄	27.00	26.33	94.67	87.33	10.88	8.45
T ₅	6.67	6.33	39.33	40.33	3.97	3.72
T ₆	27.67	27.00	93.33	85.00	10.87	8.55
T ₇	6.33	6.67	37.33	36.33	3.64	3.17
T ₈	27.00	26.33	94.33	87.33	11.32	9.39
T ₉	27.33	26.67	96.33	89.33	11.18	8.79
T ₁₀	28.00	27.00	95.67	88.67	11.28	8.77
T ₁₁	28.33	27.00	98.33	90.67	11.32	9.17
T ₁₂	26.00	26.33	99.00	93.00	11.88	9.18
S.E.±	1.28	1.26	2.99	2.83	0.44	0.56
C.D. (P=0.05)	3.75	3.69	8.76	8.29	1.28	1.65
CV (%)	9.26	9.33	5.97	6.06	7.52	12.01

Effect on yield and yield attributing characters of toria :

The data on yield and yield attributing characters of toria are presented in Table 2. Except test weight (g) of toria, all other characters were significantly influenced by the weed management practices. Among the various treatments, metsulfuron + chlorimuron (Almix) at 4 g at 10 DAS followed by bispyribac sodium at 25 g at 20 DAS (T_5) and fenoxaprop at 60 g ha⁻¹ + metsulfuron + chlorimuron (Almix) at 4 g ha⁻¹ at 15 DAS (T_7) recorded the lowest number of siliqua per plant, seeds per siliqua and lowest length of siliqua and thus, resulted in the lowest yield in both the years. Other treatments were statistically at par among each other. These observations suggested that the herbicide almix had residual (harmful) effect on succeeding toria which was reflected by significant reduction in various yield attributing characters and yield (Table 2).

In the present study, the persistence of herbicides like pendimethalin, 2, 4-D, bispyribac sodium, fenoxaprop, almix and pyrazosulfuron ethyl was studied by sowing toria in the same field after harvesting of rice. Except the treatment almix at 4 g at 10 DAS followed by bispyribac sodium at 25 g at 20 DAS (T_5) and fenoxaprop at 60 g ha⁻¹ metsulfuron + chlorimuron (Almix) at 4 g ha⁻¹ at 15 DAS (T_7), all other treatments were found

comparable with that of untreated control (T_{12}). Except almix, presumably all the other herbicides had degraded, leaving little toxic residue in soil. This is in conformity with the report of Randhawa *et al.* (2007) who studied that there was no residual carry over effects of pyrazosulfuron ethyl applied in rice at 15 and 30 g ha⁻¹ using wheat, gram and pea as indicator plants. Differences were non-significant for dry matter accumulation in these plants, indicating that there was no residual effect of herbicides in soil after the harvest of rice crop. There was no phytotoxic effect of bispyribac upto 60 g ha⁻¹ on rice and no residual toxicity on succeeding wheat crop (Yadav *et al.*, 2009 and 2010) and hence, it could safely be used in rice wheat system (Yadav *et al.*, 2010). Similarly non-persistent nature of 2, 4-D was reported by Amenna (1999) who studied the herbicide residues in soils treated with 2, 4-D in similar lines. The result thus showed that pyrazosulfuron ethyl, pendimethalin, bispyribac sodium, fenoxaprop, 2, 4-D when applied in upland rice do not persist in soil and can have no adverse effect on the succeeding crop. But the emergence, growth characters, yield attributing characters and yield of toria of the present investigation showed that almix had residual toxicity to succeeding toria.

Table 2 : Effect of treatments on length of siliqua, yield components and yield of toria

Treatments	Length of siliqua (cm)		No. of siliqua plant ⁻¹		No. of seeds siliqua ⁻¹		Seed yield (kg ha ⁻¹)		Test weight (g)	
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
T ₁	4.99	4.87	99.7	94.7	21.0	19.6	867	794	2.70	2.67
T ₂	5.07	5.06	97.5	92.0	21.0	21.3	899	846	2.72	2.68
T ₃	5.12	5.07	105.3	94.3	20.6	20.3	890	844	2.75	2.65
T ₄	5.08	5.00	100.7	95.5	20.3	19.6	877	834	2.71	2.71
T ₅	3.39	3.38	19.2	21.5	15.0	14.3	55	60	2.66	2.69
T ₆	5.03	5.22	101.3	96.0	21.3	20.3	895	805	2.76	2.76
T ₇	3.88	3.80	17.2	20.5	15.3	15.3	50	55	2.65	2.65
T ₈	5.00	4.94	104.3	97.7	20.3	20.6	867	833	2.72	2.66
T ₉	4.94	5.00	97.3	93.2	20.3	20.0	886	785	2.72	2.70
T ₁₀	5.05	4.87	106.8	98.2	21.0	21.0	875	799	2.75	2.71
T ₁₁	5.09	4.92	97.5	92.5	20.6	20.3	887	834	2.74	2.72
T ₁₂	5.04	4.99	99.7	95.0	20.3	21.0	853	831	2.74	2.71
S.E.±	0.15	0.10	3.59	3.49	0.65	0.94	39.02	41.87	0.04	0.05
C.D.(P=0.05)	0.46	0.30	10.54	10.24	1.91	2.78	114.44	122.82	NS	NS
CV (%)	5.70	3.77	7.14	7.32	5.69	8.43	9.11	10.46	2.27	3.07

NS= Non-significant

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