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Response of Wheat (*Triticum Aestivum*) to Seeding Methods and Weed Management Practices

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ABSTRACT: *The experiment was conducted at Crop Research Farm, Department of Agronomy, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, U.P., during* rabi *season 2009-2010. The experiment consisted of three methods of sowing FIRB system, Broadcast and Line sowing method and five weed management practices namely weedy check, weed free, sulfosulfuron at 33 g/ha, Metsulfuron at 4 g/ha and Isoproturon at 750 g/ha (post-emergence). Highest plant height, plant dry weight, Crop Growth Rate and Relative Growth Rate was found in the treatment FIRB system of sowing while the weed management practices sulfosulfuron at 33 g/ha recorded maximum plant height, maximum plant dry weight, Crop Growth Rate and Relative Growth Rate. Minimum weed density, weed dry weight and weed index was recorded in FIRB system of sowing. Among the weed management practices sulfosulfuron at 33 g/ha recorded minimum weed density, weed dry weight and weed index. More number of spike/plant, grains/spike, highest test weight, grain yield, and straw yield was recorded in FIRB system of sowing while in weed management practices these parameters were highest in sulfosulfuron at 33 g/ha.*

Key words: *wheat, FIRB, sulfosulfuron, Metsulfuron, Isoproturon,* Triticum aestivum *L.*

INTRODUCTION

Uniform and optimum distribution of plants per unit area is one of the factors responsible for increasing wheat yield. *Phalaris minor*, Retz and *Avena ludoviciana*, Durieu emerged as serious weeds of wheat crop in rice-wheat cropping system and because of their morphological similarities with the crop, they are not easily identified by farmers and defy all manual mechanical attempts to control them. Among the existing herbicides isoproturon has been intensively use for controlling these weeds since last 15 years (Gupta *et al*., 1990). Due to continuous use of isoproturon, *Phalaris minor* has developed resistance to this herbicide (Walia *et al.,* 1997). To overcome to this problem, a judicious combination of seeding methods and weed management may act synergistically to control weeds and ultimately boost up the crop yield.

Adoption of rice-wheat rotation coupled with irrigation and fertilizer use provides favourable ecological conditions for the weed growth and development and creates a serious problem in the wheat crop. Wheat fields are generally infested with both grassy and non-grassy weeds. In various wheat growing states of our country, grassy weed especially *Phalaris minor* is causing yield reduction to the level of 30-80% (Brar and Singh, 1997). Isoproturon is being used successfully since 1982 for control of *Phalaris minor* but due to its continuous use *Phalaris minor* has developed resistance against it (Malik and Singh, 1993).

Metsulfuron methyl is a potential low dose herbicide for control of broad leaf weeds in rabi season (Beyer *et al*., 1988). At optimum dose, it is safe for most of the wheat cultivars grown in India (Balyan *et al*., 1997), which is not true for the traditional herbicide 2,4-D. Hence, it has great scope as a potential herbicide but, its low dose requirement is also associated with its longer persistence in soil.

MATERIALS AND METHODS

The field experiment entitled "Response of wheat (*Triticum aestivum* L) to seeding methods and weed management practices" was carried out at the Crop Research Farm, Department of Agronomy, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, U.P. during rabi season in the year 2009-2010. The experiment included T_1 - FIRB

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system + Weedy Check, T_2 - FIRB system + Weed Free, T_3 - FIRB system + Sulfosulfuron at 33g/ha (Post Emergence), T_4 - FIRB system + Metasulfuron at 4g/ha (Post Emergence), T_5- FIRB system + Isoproturon at 750g/ha (Post Emergence), T_6- Broadcast Sowing Method +Weedy Check, T_7 - Broadcast Sowing Method + Weed Free, T_8 - Broadcast Sowing Method + Sulfosulfuron at 33g/ha (Post Emergence), T_9- Broadcasting Sowing Method + Metasulfuron at 4g/ha (Post Emergence), T_{10}- Broadcast Sowing Method + Isoproturon at 750g/ha (Post Emergence), T_{11}- Line Sowing Method + Weedy Check, T_{12}- Line Sowing Method + Weed Free, T_{13}- Line Sowing Method + Sulfosulfuron at 33g/ha (Post Emergence), T_{14}- Line Sowing Method + Metasulfuron at 4g/ha (Post Emergence), T_{15}- Line Sowing Method + Isoproturon at 750g/ha (Post Emergence).The experiment was laid out in Split Plot Design with three replications. The average rainfall in this area is above 90 cm during the winter months. Mechanical and chemical analysis of soil was done before experiment to know the initial status of the soil. The soil was sandy loam having 60% sand, 20% silt and 14.4% clay. The soil contained 0.39% organic carbon, 15 kg/ha available P and 325 kg/ha available K with pH 7.5 in the year of experiment. The observations were recorded for various vegetative traits of wheat and weed density (No./m2), dry weight (g/0.25m2) at 30 DAS and 60 DAS. The spray of all herbicides as post-emergence in 800 liters of water was done to control weeds till 30 days after sowing in order to reduce crop-weed competition.

RESULTS AND DISCUSSION

Effect on Growth and Growth Attributes

Method of sowing significantly affected the various growth parameters of wheat crop. The FIRB system of sowing exhibited the maximum plant height, plant dry weight, Crop Growth Rate and Relative Growth Rate. The FIRB system of sowing is fully suitable for wheat production and best for crop growth. Similar finding was also reported by Zhang *et al*. (2007). Among the weed management practices sulfosulfuron at 33 g/ha recorded maximum plant height, maximum plant dry weight, Crop Growth Rate and Relative Growth Rate over rest of the treatments. The increase in growth parameters in this treatment might be due to less weed population in the aforesaid treatment as compared to other treatments. This result supported the previous results of authors (Zhang *et al*. 2007, Rathi *et. al.* 2008).

Effect on Weeds

Among the different methods of sowing lowest weed density, weed dry weight and weed index was recorded with Furrow Irrigated Raised Bed system of sowing throughout the crop growth stages and was found to be significant. While in weed management practices, minimum weed density was recorded by weed free treatment followed by treatment in which sulfosulfuron was applied at 33 g/ha and maximum weed density, weed dry weight and weed index was recorded in control plot. The minimum weed dry weight in sulfosulfuron treated plot was due to broad spectrum control of both narrow and broad leaf weeds. Similarly, lowest weed dry weight under weed free was due to slow pace of growth of first flush of weeds, thereafter emergence of new flushes of weeds could not attain full growth under shade of crop plant. Similar finding was also reported by Pandey *et al.* (2006). Maximum weed control efficiency was recorded in FIRB system of sowing and sulfosulfuron applied at 33 g/ha. Higher weed control efficiency might be due to inhibition in germination of weed seeds, reduce cell division and cell elongation resulting in lesser weed dry weight and weed population. Similar finding was recorded by Pandey *et al.* (2006).

Yield and Yield Attributes

Among the different method of sowing maximum number of spikes/plant was recorded with Furrow Irrigated Ridge Bed System of sowing. Similar finding were also reported by Pratik *et al.* (2002). Among the weed management practices, maximum number of spikes/plant was recorded by weed free treatment followed by treatment in which sulfosulfuron was applied at 33 g/ha. The weed free and sulfosulfuron were equally effective in the enhancement of number of spikes/plant. Similar finding was also reported by (Gupta *et al*. 2004). Similarly, sulfosulfuron was effective against both grasses and broad leaves weed achieving 90% control. Post-emergence application of sulfosulfuron at 33 g/ha to provided good control of *Phalaris minor* and *Melilotus alba* in wheat (Chauhan *et al.* 2000). The highest grain yield was recorded in FIRB system compared with other methods. (Zhang *et al*. 2007). Among the weed management practices maximum grain yield was recorded by weed free treatment followed by treatment in which sulfosulfuron was applied at 33 g/ha. Increase in the grain yield due to sulfosulfuron application on the yield of wheat may be attributed to its role in suppressing various weeds flora, resulting in good

growth of crop. The results are in accordance with those of Gupta *et al.* 2004. Among the different methods of sowing highest straw yield was recorded with Furrow Irrigated Ridge Bed system of sowing whereas in the weed management practices maximum straw yield was recorded by weed free treatment followed by treatment in which sulfosulfuron was applied at 33 g/ha.

Table 1
Response of Wheat to Seeding Methods and Weed Management Practices on Growth and Weeds at Harvest

	Treatments	*Plant height (cm)*	*Dry weight (g)*	*C.G.R (g/m^2/ day)*	*R.G.R. (g/g/ day)*	*Weed density (No./0.25 m^2)*	*Weed dry weight (g)*	*Weed control efficiency (%)*	*Weed index (%)*
	Methods (M)								
M_1	FIRB system102.85	61.12	43.66	0.005764	51.66	14.23	76.53	10.84	
M_2	Broadcasting sowing method	98.77	55.94	12.31	0.005281	64.03	19.32	68.21	30.56
M_3	Line sowing of method	99.73	59.61	29.36	0.006034	63.56	19.18	68.37	14.94
	F-test	S	S	S	S	S	S	-	-
	S.Ed. (±)	0.69	0.29	1.05	0.000000029	4.64	0.18	-	-
	C.D. at 5%	1.91	0.80	2.91	0.000000081	12.88	0.49	-	-
	Weed management (W)								
W_1	Weed check	97.12	54.48	24.76	0.005434	195.22	56.33	7.13	31.96
W_2	Weed free	103.10	63.63	33.45	0.006178	0	0.00	100.00	15.01
W_3	Sulfosulfuron at 33 g/ha	102.82	62.06	31.50	0.006024	20.88	9.37	84.54	12.67
W_4	Metsulfuron at 4 g/ha	101.08	58.55	26.79	0.005444	33.33	10.66	82.41	15.89
W_5	Isoproturon at 750 g/ha	98.12	55.72	25.72	0.005383	49.33	11.52	81.12	19.76
	F-test	S	S	S	S	S	S	-	-
	S.Ed. (±)	0.78	0.09	1.07	0.000000043	13.08	0.44	-	-
	C.D. at 5%	1.60	0.18	2.20	0.000000088	26.99	0.90	-	-

Table 2
Response of Wheat to Seeding Methods and Weed Management Practices on Yield Attributes and Yield of Wheat at Harvest

	Treatments	*No. of spikelets/ plant (No.)*	*No. of grains/ spikelet (No.)*	*Test weight (g)*	*Grain yield (q/ha)*	*Straw yield (q/ha)*
	Methods (M)					
M_1	FIRB system 6.67	42.12	38.05	45.66	68.50	
M_2	Broadcasting sowing method	5.81	32.50	34.43	34.72	52.08
M_3	Line sowing of method	6.18	35.79	37.42	42.53	63.80
	F-test	S	S	S	S	S
	S.Ed. (±)	0.025	2.02	0.18	0.13	0.29
	C.D. at 5%	0.069	5.60	0.49	0.36	0.80
	Weed management (W)					
W_1	Weed check	5.17	28.92	31.11	34.02	51.03
W_2	Weed free	7.00	41.55	39.44	45.00	67.50
W_3	Sulfosulfuron at 33 g/ha	6.91	40.77	39.00	43.66	65.50
W_4	Metsulfuron at 4 g/ha	6.35	37.47	37.50	42.05	63.08
W_5	Isoproturon at 750 g/ha	5.60	35.33	35.37	40.12	60.18
	F-test	S	S	S	S	S
	S.Ed. (±)	0.10	0.53	0.15	0.12	0.28
	C.D. at 5%	0.20	1.09	0.30	0.24	0.57

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