

Influence of integrated weed management on growth, productivity and economics of wheat (*Triticum aestivum* L.)

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ABSTRACT

A field experiment was conducted at College of Agriculture, Loni Farm during 2015 and 2016 on silty clay loam soil with 7.4 pH. The climatic conditions during experimental period were favourable. The experiment was laid out in randomized block design with three replications. The treatments consisted of combination of cultural treatments, pre- and post-emergence herbicides as well as unweeded check. The results showed that the growth parameters, yield attributes, seed yield and straw yield were increased significantly by treatment 3 HW at 20, 40 and 60 DAS which was at par with treatments pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS, metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS and 2,4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS which was followed by treatment metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS and metribuzin @ 200 g a. i./ha POE at 20 DAS. The B : C ratio and net returns were found significantly higher in treatment pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS. Minimum growth parameters, yield attributes, yield and economics were noticed in treatment unweeded control.

Key words : Economics, integrated weed management, wheat, yield

INTRODUCTION

Wheat (*Triticum aestivum* L.) belongs to family Graminae and genus *Triticum*. It is the second in area and production and stood first in productivity among the cereals. It is the most important grain crop because of its bread making quality. It also contains good amount of most important and world's most widely cultivated staple food crop. In India, wheat ranks second in area and production and stood first in productivity among the cereals. It is the most important grain crop because of its bread making quality. It also contains good amount of proteins, vitamins and minerals. A major factor responsible for less productivity of wheat is the weed competition which reduces the yield by 29% (Pandey and Verma, 2002; Gopal *et al.*, 2017). The major weeds associated with wheat crop are *Cynodon dactylon*, *Chinopodium album*, *Convolvulus arvensis* and *Portuleca oleracea*, etc. (Singh and Singh, 2005). Weed should be controlled at its critical period viz., up to first 30 to 40 days, so use of pre-emergence

herbicides is the better way to control the weeds. Weeds compete with the main crop for nutrients, space, sunlight and moisture and depleted 83.4, 18.7 and 80.8 kg/ha of nitrogen, phosphorus and potassium, respectively, which was 47.1, 11.5 and 55.21 kg/ha higher than the total uptake of these nutrients by wheat crop (Kumar *et al.*, 2005). Continued use of specific herbicides on the same land has developed a resistance in some types of weeds viz., isoproturon resistance in *Phalaris minor* (Chokkar and Malik, 2002; Patel *et al.*, 2017) which cause heavy yield loss in wheat. The mechanical method of weed control is still more effective but labour is very costly and also not available when required. So, a multipronged, holistic multidisciplinary approach viz., integrated weed management is the best measure for crop protection.

MATERIALS AND METHODS

The field experiment was conducted at College of Agriculture, Loni Farm during 2015 and 2016. The soil of experimental plot was

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silty clay with 7.4 pH, EC was 0.53 dS/m and the organic carbon was 0.45%. The available N was 163.28 kg/ha, available P was 20 kg/ha and available K was 455.16 kg/ha. The layout of experiment was randomized block design composed of eight treatments viz., T₁ : Pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS, T₂ : Metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, T₃ : Metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, T₄ : 2, 4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS, T₅ : Metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS, T₆ : Metribuzin @ 200 g a. i./ha POE at 20 DAS, T₇ : 3 HW at 20, 40 and 60 DAS and T₈ : Unweeded control. The replications were three. The recommended dose of 120 : 60 : 40 kg NPK/ha was calculated for each plot and applied in the form of urea, single and super phosphate and muraite of potash. Sixty kg N, 60 kg P and 40 kg K were applied as basal dose (at the time of sowing) and remaining 60 kg N was applied 21 DAS. The wheat variety NIDW-295 (Godawari) was sown on 25 November 2015. The seed rate was 100 kg/ha and row spacing was 22.5 cm. The observations on growth, yield, yield attributes and economics were recorded at harvest. The data were analyzed statistically for test of significance (Gomez and Gomez, 1984). The interpretation of data was done by using CD value calculated at P≥0.05 and level of significance for F test was tested at 5%.

RESULTS AND DISCUSSION

The data showed that growth

characters, yield attributing characters, yield and economics of wheat were significantly increased by different weed control practices (Table 1). Maximum plant height and number of tillers per running metre were noticed with treatment 3 HW at 20, 40 and 60 DAS which were at par with treatments pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS, metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS and 2,4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS (Pandey and Verma, 2002; Rajpar *et al.*, 2010; Pisal and Sagarka, 2013). The yield attributing characters viz., length of spike, number of grains per spike and test weight were found significantly increased by treatment 3 HW at 20, 40 and 60 DAS which were at par with treatments pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS, metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS and 2,4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS (Yadav *et al.*, 2001; Kumar *et al.*, 2013). The results revealed that significantly the highest grain and straw yield was registered with treatment 3 HW at 20, 40 and 60 DAS which was at par with treatments pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS, metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS and 2,4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS (Tiwari and Kewat, 2010; Katara *et al.*, 2012; Singh *et al.*, 2013).

Table 1. Effect of integrated weed management on growth, yield attributing characters, grain yield, straw yield and economics of wheat (*rabi* 2015)

Treatment	Plant height (cm)	No. of tillers/running metre	Length of spike (cm)	No. of grains/spike	1000-grain weight (g)	Grain yield (q/ha)	Straw yield (q/ha)	Net returns (Rs.) (x 10 ³ /ha)	B : C ratio
T ₁	88.97	192.18	7.48	46.53	45.38	49.09	71.42	58.48	2.36
T ₂	87.22	181.09	7.29	44.29	45.19	46.68	68.43	54.20	2.30
T ₃	86.53	171.23	7.19	43.72	44.82	46.23	65.93	53.52	2.28
T ₄	85.69	170.27	7.10	43.12	44.40	46.12	65.52	52.72	2.26
T ₅	85.38	143.35	6.69	42.43	43.18	42.13	62.69	47.95	2.23
T ₆	84.82	138.18	6.53	41.78	43.09	42.18	61.98	47.51	2.22
T ₇	91.96	203.93	8.12	49.18	46.12	51.93	77.53	51.60	1.95
T ₈	82.92	102.12	6.00	40.89	42.15	30.82	43.12	28.37	1.81
C. D. (P=0.05)	6.34	33.71	1.05	6.38	2.31	6.94	12.68	13.31	0.23

T₁ : Pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS, T₂ : Metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, T₃ : Metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, T₄ : 2,4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS, T₅ : Metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS, T₆ : Metribuzin @ 200 g a. i./ha POE at 20 DAS, T₇ : 3 HW at 20, 40 and 60 DAS and T₈ : Unweeded control.

The net returns were found significantly superior to treatment pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS except treatment metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, 2,4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS, metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS and metribuzin @ 200 g a. i./ha POE at 20 DAS, 3 HW at 20, 40 and 60 DAS (Chopra and Chopra, 2010; Kumar *et al.*, 2013). The B : C ratio was found significantly superior to treatment pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS which was at par with treatment metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, metribuzin @ 200 g a. i./ha POE at 20 DAS fb hoeing at 30 DAS, 2,4-D @ 500 g a. e./ha POE at 20 DAS fb hoeing at 30 DAS, metsulfuron methyl @ 5 g a. i./ha POE at 20 DAS and metribuzin @ 200 g a. i./ha POE at 20 DAS (Sharma, 2009). Significantly the lowest growth characters viz., plant height, number of tillers per running meter, yield attributing factors viz., length of spike, number of grains per spike, 1000-grain weight, grain yield, straw yield, B : C ratio and net returns were associated with treatment unweeded control (Kumar *et al.*, 2013; Singh *et al.*, 2013).

CONCLUSION

Higher growth parameters, yield attributing factors, seed yield and grain yield resulted in 3 HW at 20, 40 and 60 DAS. This method was found to be the best method of weed control where labour was available easily, cheap and not a constraint but the places where labour was expensive and time consuming was a constraint then pendimethalin @ 750 g a. i./ha as pre-emergence fb hoeing at 30 DAS was found to be the best method.

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