

Original Research Article

Productivity and Profitability of Wheat (*Triticum aestivum*) as Influenced by Weed Management Practices under Irrigated Condition

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ABSTRACT

An experiment was conducted during the winter (Rabi) seasons of 2012-13 and 2013-14 at different farmers' field of Muzaffarpur district of Bihar, to find out the effect of five different weed management practices to control complex weed flora in wheat (*Triticum aestivum* L.) crop. Pooled data of two years experimentation indicated that the application of various weed management practices significantly increased growth and yield attributes, viz. plant height, effective tillers/m², no. of grain/earhead and 1,000 – grain weight etc. Yield, harvest index and monetary income of wheat crop were significantly influenced by application of weed management practices. Among all treatments, application of sulfosulfuron + metsulfuron @ 30 + 2 g a.i./ha resulted in higher number of effective tillers (347.4/m²), the maximum grain yield (4.34 t/ha), harvest index (39.20 %), net returns (Rs 43,140/ha) and benefit : cost ratio (2.51), which was superior to rest of the treatments. Two year study indicates that the application of a ready –mixed herbicide (sulfosulfuron + metsulfuron) @ (30 + 2) g a.i./ha was best for higher yield and net returns from wheat in north Bihar.

Keywords

Benefit : cost ratio,
Herbicides, Net
Returns, weed
management,
Yield

Introduction

Wheat is one of the most important cereal crops of India not only in terms of meeting calorie requirement of sizable segment of the society, but also in terms of its versatility for adoption under wide range of agro-climatic conditions and crop growing situations. It is cultivated on an area of 30.37 million hectares in India with an annual production of 90.78 million tonnes with a productivity of 2.99 tonnes/ha (Anonymous, 2015).

Weeds are a major impediment to crop production through their ability to compete for resources and their impact on product

quality (Rao and Nagmani 2010) and causes yield reduction in the range of 15 – 50% or sometimes more depending upon weed density and type of weed flora (Jat *et al.* 2003) and makes weed control more complex. Irrigated eastern region of India is in grip of serious menace of grassy and broadleaf weeds notably little canary grass (*Phalaris minor* Ritz.), common lambs quarter (*Chenopodium album* L.), Krishna ni (*Angallis arvensis* L.) and hiran khuri (*Convolvulus arvensis*). Singh *et al.* (2013), while analyzing yield gaps, found 26.4 % less wheat yield on farmers' field compared to demonstration yield. Their technical

constraint analysis revealed that weed infestation was the second most important hindrance in wheat harvest. Numerous trials in India have shown the average yield loss cause by weeds in different wheat growing zones ranging from 20 to 32 % (Chhokar *et al.*, 2012). Therefore, appropriate weed management technology can help in increasing the productivity and production of this crop. Wide range of herbicides are under recommendation for weed control in wheat, but most of them suffer from narrow spectrum control, viz. either grassy or broadleaf ones. This has opened a new vista of applying herbicides of diverse selectivity together. One way is to apply two herbicides one after the other in sequence. However, mixtures have shown encouraging results. (Kumar *et al.*, 2013) to save time and cost, instead of sequential application of herbicides. Keeping all these in view the present study was under taken to find out the best weed management practice for getting higher productivity and economic benefits from wheat.

Materials and Methods

A field experiment was conducted during rabi season of 2013 – 14 and 2014 - 15 with wheat at farmers' field of Muzaffarpur district of Bihar (located between 24°54' to 26 °23' N latitude and 84 °53' to 85 °45' E longitude with altitude of 51.81 m). The soil was sandy loam to loam, young alluvial calcareous in nature with pH 7.8 to 8.4, low in available nitrogen (177.01 kg/ha) and medium in available phosphorus (13.80 kg/ha) and potassium (137.28 kg/ha). Five treatments comprised farmers' practice (one hand weeding at 25 DAS), two hand weeding (at 20 DAS and 40 DAS), isoproturon + 2,4 – D (1000 + 500 g/ha), sulfosulfuron (25 g/ha) and sulfosulfuron + metsulfuron (30 + 2 g/ha). The experiment was laid out in a randomized block design

with five replication. All the herbicides were applied 30 days after sowing (DAS) by knapsack sprayer, fitted with flat – fan nozzle using 600 litres water/ha Wheat cultivar 'HD 2733' was sown on 23 November 2013 and 26 November 2014, using seed rate 100 kg/ha. A uniform nutrient dose of 120:60:40 kg/ha N:P₂O₅:K₂O respectively was applied in the form of urea, di ammonium phosphate and muriate of potash respectively. One-third nitrogen and full dose of phosphorus and potassium was applied basal and remaining two- thirds N was applied in two equal splits at crown root initiation and tillering stages. Growth parameters, grain yield and its attributes were recorded during the course of investigation.

Results and Discussion

Growth and yield attributes and yield

The results showed that plant growth attributes viz. plant height and dry matter accumulation were significantly increased in weed management treatments compared to farmers' practice (table 1). Yield attributes like effective tillers/m², earhead length, no. of grains/ earhead and test weight were significantly higher than farmers' practice. The maximum value of plant height (91.05 cm), dry matter accumulation/m² (1027.72 g), effective tillers/m² (347.4), earhead length (13.46 cm), no. of grains/earhead (46.20) and 1,000 grain-weight (44.6 g) were recorded when weeds were controlled by application of sulfosulfuron + metsulfuron, which was superior to all other treatments in both the years. Combination of sulfosulfuron 30 g/ha +metsulfuron 2 g/ha recorded higher value of all growth and yield attributes which was at par with two hand weeding (at 20 and 40 DAS) and isoproturon + 2,4- D (1,000 + 500 g a.i./ha) in both the years.

Table.1 Effect of weed management practices on growth parameters and yield attributes of wheat (pooled data over two years)

Treatments	Dose (g/ha)	Plant height at maturity (cm)	Dry matter accumulation/m ² at maturity (g)	Effective tillers/m ²	Earhead length (cm)	No of grains /earhead	1000 grain weight (g)
Farmers Practice (one hand weeding at 25 DAS)		82.06	705.9	241.8	11.02	34.1	38.7
Two hand weeding (at 20 and 40 DAS)		89.4	962.15	336.2	13.12	41.8	44.1
Isoproturon + 2,4-D	1000 + 500	89.01	934.2	331.7	12.81	41.02	43.8
Sulfosulfuron	25	86.09	889.85	302.5	11.78	39.48	41.3
Sulfosulfuron + Metsulfuron	30 + 2	91.05	1027.72	347.4	13.46	46.2	44.6
SEm±		1.54	44.78	14.70	0.51	2.32	0.97
CD at 5 %		4.38	129.87	44.06	1.58	6.62	2.86

Table.2 Effect of weed management practices on productivity and economics of wheat (pooled data over two years)

Treatments	Dose (g/ha)	Grain yield (t/ha)	Straw yield (t/ha)	Harvest Index (%)	Gross returns(×10 ³ ₹)	Net Returns(×10 ³ :₹)	B:C ratio
Farmers Practice (one hand weeding at 25 DAS)		3.49	6.63	34.47	57.6	27.9	1.94
Two hand weeding (at 20 and 40 DAS)		4.19	6.53	39.08	69.1	36.7	2.12
Isoproturon + 2,4-D	1000 + 500	4.01	6.30	38.55	66.2	39.1	2.44
Sulfosulfuron	25	3.89	6.50	37.46	64.2	36.9	2.35
Sulfosulfuron + Metsulfuron	30 + 2	4.34	6.73	39.20	71.6	43.1	2.51
SEm±		0.11	0.06	0.70	1.12	1.63	0.048
CD at 5 %		0.35	0.19	1.98	3.5	4.8	0.14

Among all treatments, significant increase in yield components resulted in highest grain

yield (4.34 t/ha) in sulfosulfuron + metsulfuron treatment which was at par with

two hand weeding and isoproturon + 2,4- D treatment. A similar trend was observed in straw yield and harvest index (table 2). The better expression of yield attributes of wheat plants under the influence of herbicide mixtures was owing to poor resurgence and growth of weeds. The findings of Yadav et al. (2010) supports the superiority of herbicide mixture over their alone application in improving wheat yield components and yield. The results are also in agreement to Chopra et al. (2008).

Economics

The highest net returns (Rs 43,140/ha) and benefit : cost ratio (2.51) were observed in herbicide treatment sulfosufuron + metsulfuron which was statistically similar to isoproturon + 2,4- D while superior to rest of the treatments.

Based on the above results, it may be concluded that application of Total ,a ready-mixed herbicide (sulfosulfuron +metsulfuron) @ (30+2) g a.i./ha reduces population of weeds thereby recommended for higher yield, net returns and benefit : cost ratio of wheat in north Bihar.

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