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## Effect of nutrient management and weed control practices on weed dynamics in wheat crop (*Triticum aestivum* L.)

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### Abstract

A field experiment was conducted at Agronomy Research Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (Uttar Pradesh) during Rabi season (2019-20) to find out the effect of nutrient management and weed control practices on weed dynamics of different treatments in wheat crop. The experiment was laid out in Factorial Randomized Block Design with three (3) nutrient levels and five (5) weed control practices. Among nutrient management 75% RDF + 10 t ha<sup>-1</sup> FYM found better for effective control of weed density, weed dry weight, weed control efficiency (%), weed index (%) and nutrient removal by weeds. Application of Sulfosulfuron+ Metsulfuron@ 30+2 g a.i. ha<sup>-1</sup> minimized the density and dry weight of weeds, whereas maximum weed control efficiency (91.47%) and minimum weed index (1.98%) was recorded, which was comparable with two hand weeding. This treatment having better weed control and higher nutrient uptake resulted in higher yield. It can be concluded that application of 75% RDF + 10 t ha<sup>-1</sup> FYM with the spraying of Sulfosulfuron+ Metsulfuron@ 30+2 g a.i. ha<sup>-1</sup> proved better to minimize the weed infestation and nutrients removal.

**Keywords:** Nutrient, management, control, dynamics, wheat

### Introduction

Wheat (*Triticum aestivum* L.) is staple food of the world and belongs to Poaceae family. It is commonly grown in temperate and tropical climatic regions in winter season. The Three cultivated species of wheat are *T. aestivum*, *T. durum* and *T. dicoccum* that are called as Common bread wheat, Marconi wheat and Emmer wheat, respectively. In world, Wheat ranks first amongst the cereals crop having the area (217.02 mha) and production (764.50 mmt) with productivity of wheat 3.52 mt ha<sup>-1</sup> (FAS/USDA 2019-20) [7]. In India, total production of wheat crop was 99.87 mmt from a covered area of 29.65 mha with productivity of 3.37 mt ha<sup>-1</sup> during the past 2018-19 rabi season (Anonymous, 2019-20) [1]. As far as India is concerned, about 91% of the total wheat production is contributed by six northern states viz., Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan and Bihar. Among them U.P. ranks first in respect of area (9.54m.ha.) and production (32.74mt), however, the productivity (3432 kg ha<sup>-1</sup>) is comparatively low as compared to Punjab (5123 kg ha<sup>-1</sup>) and Haryana (5195 kg ha<sup>-1</sup>) states (Anonymous, 2018-19) [2].

The *Phalaris minor* is one amongst the terribly serious issue in wheat in rice-wheat cropping system and causes 65% crop losses. In order to eradication of weeds cultural, mechanical and chemical methods are commonly used. Inaccessibility of labour in peak season and adverse weather condition don't allow timely control of weeds. Therefore, weed control by mechanical means and hand or manual weeding alone isn't achievable. So, the chemical weed control is a crucial substitute. However, the repeated application of single herbicides makes the weeds resistant. In the present investigation, some of the new herbicides molecules (combination) having it's very high potency at lower doses to kill grassy along with broad leaved weeds have been developed as ready mixed.

The major challenge i.e. adoption of cereal- cereal (rice-wheat) cropping system which resulted in declining nutrition status of soil and use of insufficient amount of chemical fertilizers is increasing day by day. The balance nutrition plays an important role in raising the production potential of wheat. Application of fertilizer alone has a detrimental effect on soil health and crop productivity therefore, integration of various sources of nitrogenous (organic and inorganic) fertilizer are more suitable because this reduces the application of chemical fertilizer and cost of cultivation, besides being an environment friendly approach also indicated the beneficial effect of FYM in combination with chemical fertilizer to wheat (Ram and Mir, 2006; Gupta *et al.*, 2006) [15, 14].

## Material and Methods

The experiment was carried out during Rabi season 2019-20 at Agronomy Research farm, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.). Geographically the experimental site falls under sub-tropical climate of Indo-gangatic plains (IGP) having alluvial calcareous soil and the soil of experimental field was "silty loam" in texture, low in organic carbon and available nitrogen while medium in phosphorous and rich in potassium. The treatment comprised of 3 nutrient levels 100% RDF, 75% RDF + 10 t ha<sup>-1</sup> FYM and 50% RDF + 15 t ha<sup>-1</sup> FYM and 5 weed control practices Metribuzin + Metsulfuron (@ 150 +4 g a.i. ha<sup>-1</sup>, Sulfosulfuron+ Metsulfuron (@ 30+2 g a.i. ha<sup>-1</sup>, Clodinofof @ 60 g a.i. ha<sup>-1</sup>, Two hand weeding (after first and second irrigation) and Weedy Check was laid out in Factorial Randomized Block Design with three replications. The wheat variety NW- 5054 was sown at 20 cm rows distance at the rate of 100 kg ha<sup>-1</sup> seed rate with the help of seed drill on 7<sup>th</sup> December 2019.

## Results and Discussion

### Effect on density (no. m<sup>-2</sup>) and dry weight of weed (g m<sup>-2</sup>)

Weed density (no. m<sup>-2</sup>) and weed dry weight (g m<sup>-2</sup>) under different nutrient management and weed control practices is presented in Table 1. The Application of 75% RDF + 10 t ha<sup>-1</sup> FYM resulted significantly lower weed density and dry weight as compared to rest of the nutrient levels at each stages of crop growth, except 30 DAS. Among the herbicides, post-emergence application of Sulfosulfuron+ Metsulfuron @ 30+2 g a.i. ha<sup>-1</sup> recorded the lowest density and dry weight of grassy and BLWs. This was comparable to two hand weeding. The maximum dry matter accumulation were recorded in weedy check at 60 and 90 DAS, while minimum weed dry weight recorded with two hand weeding which was significantly lesser than the rest of the weed control practices. This might be due to more luxuriant growth of crop plant causes critical period of crop weed competition, application of higher rate of nutrients shift the competitive advantage in favor of crop and also help in smothering of weed and poor germination of weeds and the above mentioned herbicide is more effective in reducing density of weeds as compared to other herbicides. The reduced weed density under this

treatment might result less weed dry weight. The similar results have been also reported by Khoker and Nepalia (2010)<sup>[9]</sup>, Singh *et al.* (2011)<sup>[16]</sup>, Chopra and Chopra (2012)<sup>[5]</sup>, Malik *et al.* (2013)<sup>[11]</sup> and Tomar and Tomar (2014)<sup>[17]</sup>.

### Effect on weed control efficiency (%)

Weed control efficiency under different nutrient management and weed control practices is presented in Table 1. Among the nutrient levels the maximum weed control efficiency is recorded with the application of 75% RDF + 10 t ha<sup>-1</sup> FYM (70.19%). Under weed management practices, the highest weed control efficiency was recorded with two hand weeding (92.67%) followed by Sulfosulfuron + Metsulfuron @ 30+2 g a.i. ha<sup>-1</sup> (91.47%), Metribuzin + Metsulfuron @ 150 +4 g a.i. ha<sup>-1</sup> (82.12%) and Clodinofof @ 60 g a.i. ha<sup>-1</sup> (80.38%). It might be due to effectively control of narrow weeds as well as BLWs which is inversely related to weed index (%). Similar findings also reported by Meena and Singh (2011)<sup>[12]</sup> and Tomar and Tomar (2014)<sup>[17]</sup>.

### Effect on Weed Index (%)

Weed index may be termed as the competition index. It indicates the reduction of yield due to competition offered by weeds and is expressed in percentage (%).

Perusal of data presented in Table 1, revealed that the lowest yield reduction in wheat was observed in sulfosulfuron + metsulfuron @ 30+2 g a.i. ha<sup>-1</sup> (1.98%), whereas, maximum yield reduction (24.66%) was recorded under weedy check.

### Effect on NPK content in weeds

The data pertaining to NPK content (%) in weeds are presented in Table 2, revealed that the various nutrient levels and weed control practices had non-significant effect on the N, P & K content (%) in weeds. However, it has been observed that minimum N, P and K content (%) in weeds recorded with the treatment 75% RDF + 10 t ha<sup>-1</sup> FYM. Among weed management practices data indicated that minimum N, P & K content (%) in weeds were recorded in two hand weeding. It might be due to minimum weed density under these treatments. The similar results have been also reported by Dodamani and Das (2009)<sup>[6]</sup>.

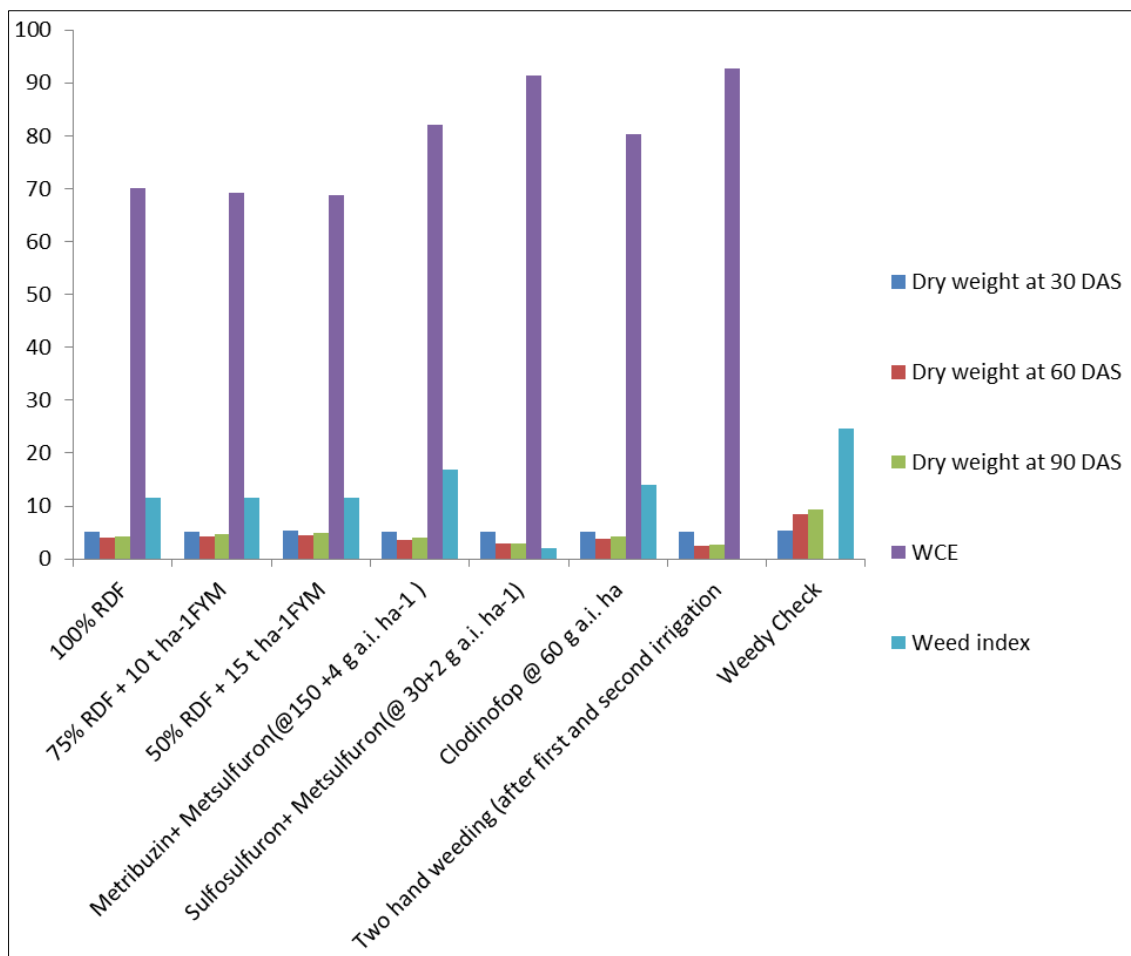
**Table 1:** Effect of nutrient management and weed control practices on weed dynamics in wheat crop (*Triticum aestivum* L.).

Treatments	Weed density (no.m <sup>-2</sup> )			Dry weight (g m <sup>-2</sup> ) Weed control			Weed control efficiency (%)	Weed Index (%)
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS		
<b>Nutrient management</b>								
100% RDF	7.91(62.12)	4.98(29.62)	5.77(39.38)	5.03(24.85)	3.99(20.23)	4.36(24.60)	70.19	11.62
75% RDF + 10 t ha <sup>-1</sup> FYM	8.16(66.26)	5.35(33.43)	5.39(35.00)	5.19(26.50)	4.25(22.31)	4.65(27.23)	69.12	11.52
50% RDF + 15 t ha <sup>-1</sup> FYM	8.28(68.22)	5.62(36.39)	6.05(42.82)	5.27(27.29)	4.44(24.02)	4.81(28.89)	68.68	11.50
S.Em±	0.132	0.102	0.100	0.082	0.066	0.077		
CD at 5%	NS	0.296	0.290	NS	0.192	0.222		
<b>Weed control</b>								
Metribuzin + Metsulfuron (@ 150 +4 g a.i. ha <sup>-1</sup> )	8.08(65.03)	4.78(22.44)	5.16(26.20)	5.10(25.59)	3.58(12.35)	4.02(15.72)	82.12	16.99
Sulfosulfuron + Metsulfuron (@ 30+2 g a.i. ha <sup>-1</sup> )	8.22(67.27)	3.83(14.29)	4.09(16.40)	5.23(26.91)	2.88(7.86)	2.82(7.51)	91.47	1.98
Clodinofof @ 60 g a.i. ha	8.02(63.97)	5.04(25.00)	5.39(28.70)	5.14(26.01)	3.77(13.75)	4.20(17.22)	80.38	14.09
Two hand weeding (after first and second irrigation)	7.92(62.40)	3.24(10.10)	3.42(11.30)	5.04(24.96)	2.45(5.56)	2.63(6.45)	92.67	0.00
Weedy Check	8.33(69.00)	9.69(93.90)	10.62(112.73)	5.29(27.60)	8.47(71.41)	9.38(87.64)	0.00	24.66
S.Em±	0.171	0.132	0.129	0.106	0.085	0.099		
CD at 5%	0.494	0.382	0.375	NS	0.248	0.287		

**Effect on NPK removal by weeds (kg ha<sup>-1</sup>)**

The analyzed data pertaining to NPK removal by weeds are presented in Table 2 indicate that nutrient levels and weed control practices had a significant difference in N, P and K removal by weeds. The lowest N, P and K removal by weeds was recorded with the treatment 75% RDF + 10 t ha<sup>-1</sup> FYM which was significantly lesser than rest of the treatments.

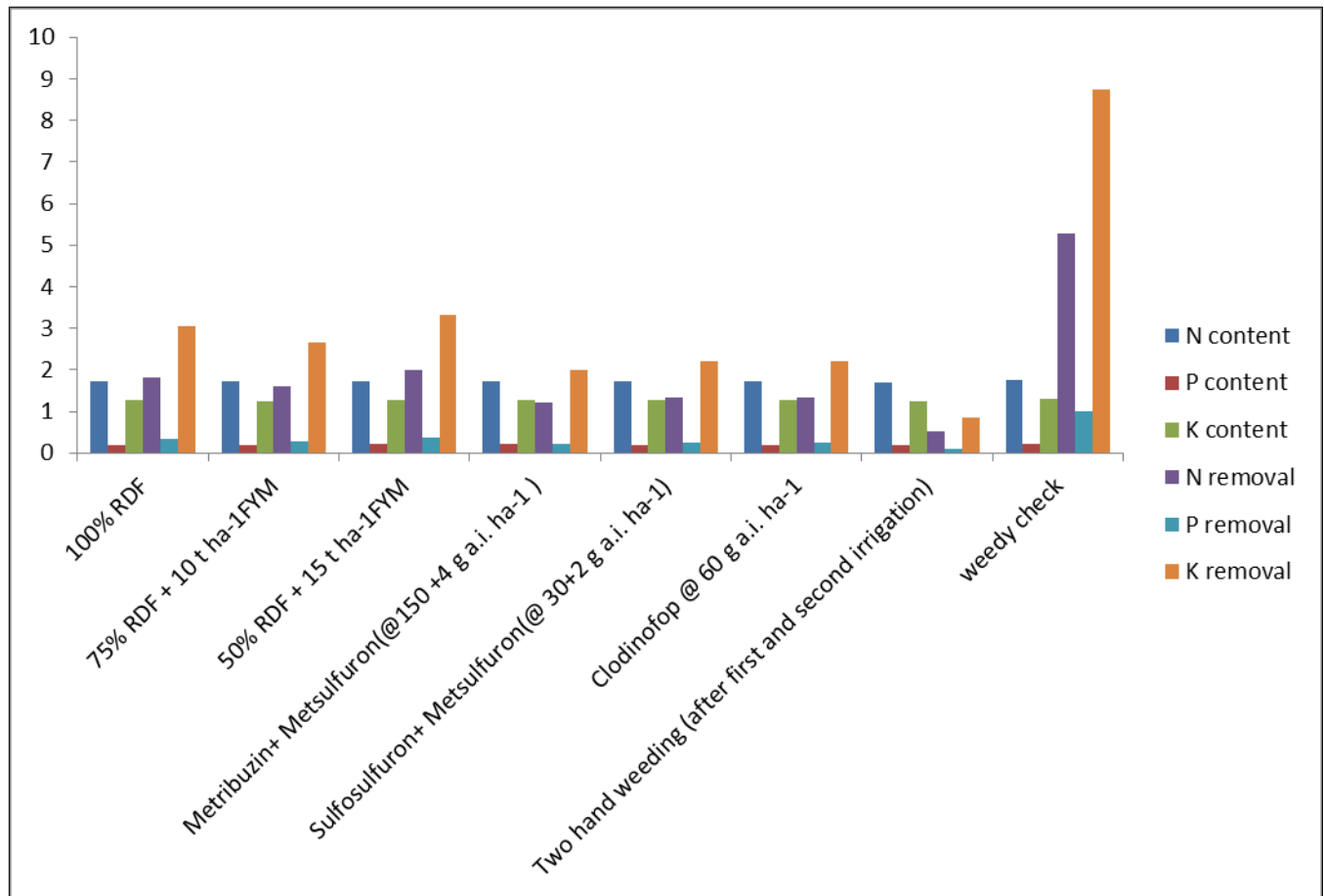
Among different weed control practices lowest N, P & K removal by weeds recorded in two hand weeding which was significantly lesser than rest of the weed control practices. It might be due to the weed population and weed dry matter production was minimum under these treatments. The similar results have been also reported by Khokhar and Nepalia (2010)<sup>[9]</sup> and Dodamani and Das (2009)<sup>[6]</sup>.



**Fig 1:** Effect of nutrient management and weed control practices on weed dynamics in wheat crop (*Triticum aestivum* L.)

**Table 2:** Effect of nutrient management and weed control practices on NPK content (%) in weeds and NPK removal by weeds (g m<sup>-2</sup>) in wheat crop (*Triticum aestivum* L.)

Treatments	NPK content (%) in weeds			NPK removal by weeds (kg ha <sup>-1</sup> )		
	N Content (%)	P Content (%)	K Content (%)	N uptake (kg ha <sup>-1</sup> )	P uptake (kg ha <sup>-1</sup> )	K uptake (kg ha <sup>-1</sup> )
<b>Nutrient management</b>						
100% RDF	1.73	0.19	1.28	1.83	0.35	3.04
75% RDF + 10 t ha <sup>-1</sup> FYM	1.72	0.19	1.25	1.62	0.29	2.67
50% RDF + 15 t ha <sup>-1</sup> FYM	1.73	0.22	1.28	2.00	0.37	3.31
S.Em±	0.016	0.029	0.012	0.053	0.011	0.053
CD at 5%	NS	NS	NS	0.154	0.032	0.154
<b>Weed control</b>						
Metribuzin+ Metsulfuron(@ 150 +4 g a.i. ha <sup>-1</sup> )	1.74	0.21	1.28	1.22	0.22	2.01
Sulfosulfuron+ Metsulfuron(@ 30+2 g a.i. ha <sup>-1</sup> )	1.72	0.18	1.26	0.75	0.14	1.24
Clodinofof @ 60 g a.i. ha <sup>-1</sup>	1.74	0.19	1.28	1.32	0.25	2.20
Two hand weeding (after first and second irrigation)	1.70	0.18	1.25	0.52	0.09	0.85
Weedy Check	1.76	0.22	1.29	5.28	0.99	8.73
S.Em±	0.021	0.038	0.016	0.069	0.014	0.069
CD at 5%	NS	NS	NS	0.199	0.042	0.199



**Fig 2:** Effect of nutrient management and weed control practices on NPK content (%) in weeds and NPK removal by weeds ( $\text{g m}^{-2}$ ) in wheat crop (*Triticum aestivum* L.).

## Conclusion

From the overall studies, it can be concluded that application of 5% RDF + 10 t ha<sup>-1</sup> FYM with the spraying of herbicide Sulfosulfuron+ Metsulfuron (@ 30+2 g a.i. ha<sup>-1</sup>) find superior for effective control of weeds and recorded higher weed control efficiency and nutrient uptake in such treatments.

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