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Effect of nutrient uptake by crop and weeds under different weed control treatment in wheat (*Triticum aestivum* L)

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Abstract
In agriculture weed causes more damage compared as to insects, pests and diseases but due to hidden loss by weed in crop production. It has not drown much attention of agriculturists. With an increase in labour cost and its unavailability is in peak period and crops susceptibility to weed compition the need of hour is to go for chemical weed control with their proper recommendation. The results of the field experiment reveled that to quantify the relative uptake by wheat and associated weeds under the influence of new herbicides. The minimum N, P and K uptake by weed was registered, when weeds were controlled by fenoxaprop p ethyl at (40, 60, 80 and 90g a.i. ha^{-1}) and tank mix combination of fenoxaprop p ethyl (30, 40 and 50g a.i. ha^{-1}) with isoproturon (500g a.i. ha^{-1}) as well as isoproturon alone at 1000g a.i. ha^{-1} at 30 DAS proved effective in reducting total weed density and dry weight of weeds and recorded significantly highest uptake of N,P and K by crop and lowest uptake by weeds.

Keywords: Fenoxaprop p ethyl, isoproturon, weed, nutrient uptake, wheat

Introduction
Wheat (*Triticum spp*.) is one of the most important grain crops which is grown in approximately 225 million hectares worldwide, about half of which is in developing countries (Pisal and Sagarka, 2013). India is the second largest producer of wheat in the world contributing about 94.88 million tonnes of grain with productivity of 2.98 t ha^{-1} from the area of 31.5 million hectares (Chhokar *et al*., 2012) [6], Weed problem is one the major barrier responsible for low productivity of wheat because weed completes with the crop for moisture, nutrients, space, light etc. The weed in India are causing substantial losses to agriculture production and the annual losses in terms of money come to the Rs. 1650 crores (Joshi 2002). Machnical method is very oldest method of weed control is time consuming and tedious and has become very costly due to unavailability of labour in peak period and labour cost are also high due to shifting of agricultural labour to industries for better and assured ways. The uses of herbicides which are most effective against broad leaf narrow leaf, weeds as well as cyprus rotantus in wheat. Therefore the present investigation were undertaken to provide appropriate options to farmers for effective weed control treatments in wheat.

Materials and methods
The field study was conducted during winter season of two year data from Crop Research Centre at Pantnagar. The predominate weed were *P. Minor*, *A ludoviciana*, *Anagallis arvensis, M. indica, Chenapodium album, Vicia sativa and C didymus.* The soil of experimental plot was sandy loam in texture high in organic carbon, available phosphorus and medium in available potassium in Ist year, while soil in the IInd year plot was medium in organic carbon, high in available phosphorus and potassium with pH 7.12. Ten treatment were laid out in randomized block design with four replications. The fenoxaprop p-ethyl alone at 40, 60, 80 and 90g a.i. ha^{-1} and tank mix combination of fenoxaprop p ethyl 30, 40 and 50g a.i. ha^{-1} with isoproturon 500g a.i. ha^{-1} as well as isoproturon alone at 1000g a.i. ha^{-1}, weed free and weedy treatments. In weed free plots weeds were removed manually with the help of khurpi as and when needed to keep the plots free from weeds. Weedy plot remained infested with the native weed population throughout the cropping season. Wheat cv. 'UP 2382' was sown with row distance of 20 cm and seed rate of 100 kg a.i. ha^{-1}. The crop was fertilized with the recommended dose of N, P_2O_5 and K_2O (120:80:00). The Potassium fertilizer was not applied since the soil of experimental plot was not lacking in this nutrient. The crop was irrigated at

crown root initiation, late tillering and boot stage during the Ist year and crown – root initiation boot and flowering stages during IInd year. At other stages there was adequate rainfall to meet the requirement. Both the herbicides were sprayed 30 days after sowing of wheat in the aqueous medium at 500 litres ha^{-1} water with the flat–fan nozzle of sprayer. Combinations of fenoxaprop p-ethyl and isoproturon were applied as tank mixture. The mean ranges of maximum and minimum temperature during the crop season were 20.4^{0}C-38.5^{0}C and 7.1^{0}C – 17.5^{0}C.

Result and discussion

On an average uncontrolled weeds depleted 29.00 and 12.50 kg nitrogen, 1.90 and 1.40 kg phosphorus and 3.60 and 3.05 kg potassium ha^{-1} at 60 and 120 days stages respectively in weedy check which was significantly higher than that of all other treatment. The highest uptake of these nutrient by weeds was recorded at 60 days stage. The reduction in the uptake of these nutrients by the weeds at 120 days stage is attributed to the reduction in total weed population and dry matter production at this stage as many of the weeds completed their life cycle and shaded their seeds before this stage there was significant reduction in the uptake of these nutrients by the weeds due to herbicides treatments. This is attributed due to the reduction in total density and dry matter production of weeds caused by herbicide treatments. Among the plots treated with herbicide the highest value with respect to nitrogen, phosphorus and potassium uptake kg ha^{-1} by weeds at 60 and 120 days stage was observed in fenoxaprop p ethyl at 40 a.i. ha^{-1} during both and years, which was significantly higher over all other treatment. However lowest value of total nitrogen, phosphorus and potassium uptake by weeds at both the stage of crop growth during both the years was recorded in a tank mixture of fenoxaprop p ethyl and isproturon at 50+500 g a.i. ha^{-1} which was significantly lower than all other treatments at both the stages during both the experimental years with increase in the rate of application of fenoxaprop p ethyl the nitrogen, phosphorus and potassium uptake kg ha^{-1} by weeds at 60 and 120 days stage decreased during both the years the significantly lowest value of nutrient uptake at 60 and 120 days stage was found in fenoxaprop p ethyl at 90 a.i. ha^{-1} over remaining rate of fenoxaprop p ethyl during both the years but the differences between fenoxaprop p ethyl at 80 and 90 g a.i. ha^{-1} was non-significant at 60 days stage during Ist years. In the same way tank mix combination of fenoxaprop p ethyl and isoprpburun nitrogen, phosphorus and potassium uptake by weeds decreased with increase in the rate of application of at both the stages during both the years and significantly lowest nitrogen, phosphorus and potassium uptake kg ha^{-1} by weeds were recorded at 50+500 g a.i. ha^{-1} in comparison to remaining rate of tank mixture. Fenoxaprop p ethyl at 60 and 80 g a.i. ha^{-1} and tank mixture of fenoxaprop p ethyl and isoproturon at 40+500 g a.i. ha^{-1} was at par with that of isoproturon at 1000 g a.i. ha^{-1} during both the stage during both the year. Fenoxaprop p ethyl at 80 g a.i. ha^{-1} at 60 and 120 days stages during both the years has nutrient uptake by weeds similar to isoproturon at 1000 g a.i. ha^{-1} and Fenoxaprop p ethyl alone at 90 g a.i. ha^{-1} isoproturon at 1000 g a.i. ha^{-1} had always significantly lowest value for nitrogen, phosphorus and potassium uptake kg ha^{-1} by weeds over fenoxaprop p ethyl at 40 g a.i. ha^{-1}. All the herbicide treatments resulted in significantly higher uptake nitrogen, phosphorus and potassium by crop than weedy check. Nitrogen, phosphorus and potassium uptake by crop were more at lowest than at 60 days stages during both the years. Crop under weedy condition removed 14.94 and 62.43 kg nitrogen 5.71 and 14.74 kg phosphorus and 15.53 and 70.56 kg potassium ha^{-1} at 60 days stage and at harvest respectively whereas weed free condition removed 31.63 and 140.82 kg Nitrogen, 11.10 and 33.98 kg phosphorus ha^{-1}. There was increase in the uptake of nitrogen, phosphorus and potassium per hectare by crop at 60 days stage and at harvest by increasing rates of application of fenoxaprop p ethyl either in a straight form or in a tank mixture with isoproturon at 500 gm a.i. ha^{-1}. There were more loss of N,P and K by weeds from un weeded control plots.

Table 1: Nitrogen, Phosphorus and potassium uptake (Kg ha-1) by weeds at 60 and 120 days stage

Treatments	Rate g a.i. ha^{-1}	Nitrogen				Phosphorus					Potassium		
		Ist year		IInd Year		Ist year		IInd Year			Ist year	IInd Year	
		60	120	60	120	60	120	60	120	60	120	60	120
Fenoxaprop p-ethyl	40	17.4 (2.91)	7.2 (2.10)	12.8 (2.62)	5.9 (1.93)	1.2 (0.78)	0.9 (0.63)	1.0 (0.69)	0.7 (0.50)	2.3 (1.99)	1.6 (0.95)	1.6 (0.95)	1.4 (0.87)
Fenoxaprop p-ethyl	60	13.6 (2.67)	4.5 (1.70)	8.6 (2.26)	3.3 (1.45)	1.0 (0.69)	0.6 (0.43)	0.7 (0.52)	0.5 (0.40)	2.0 (1.09)	1.1 (0.74)	1.3 (0.83)	1.0 (0.69)
Fenoxaprop p-ethyl	80	11.2 (2.49)	3.7 (1.54)	8.3 (2.22)	2.7 (1.30)	0.8 (0.58)	0.4 (0.33)	0.6 (0.46)	0.3 (0.26)	1.5 (0.91)	0.8 (0.58)	1.2 (0.78)	0.8 (0.58)
Fenoxaprop p-ethyl	90	10.5 (2.44)	3.2 (1.43)	6.2 (1.97)	2.1 (1.13)	0.8 (0.58)	0.3 (0.29)	0.5 (0.40)	0.2 (0.18)	1.4 (0.87)	0.8 (0.58)	0.9 (0.63)	0.6 (0.46)
Fenoxaprop p-ethyl + Isoproturon	30+500	15.1 (2.77)	4.8 (1.75)	10.5 (2.44)	3.8 (1.56)	1.1 (0.75)	0.6 (0.43)	0.8 (0.58)	0.6 (0.46)	2.0 (1.09)	1.4 (0.74)	1.3 (0.83)	1.1 (0.74)
Fenoxaprop p-ethyl + Isoproturon	40+500	10.8 (2.48)	3.1 (1.41)	6.7 (2.04)	3.6 (1.28)	0.9 (0.63)	0.4 (0.33)	0.6 (0.46)	0.3 (0.26)	1.6 (0.95)	1.0 (0.69)	1.0 (0.69)	0.7 (0.52)
Fenoxaprop p-ethyl + Isoproturon	50+500	8.9 (2.28)	2.6 (1.27)	5.8 (1.91)	1.8 (1.02)	0.8 (0.58)	0.3 (0.29)	0.5 (0.40)	0.2 (0.18)	1.2 (0.78)	0.7 (0.52)	0.7 (0.52)	0.5 (0.40)
Isoproturon	1000	11.6 (2.53)	3.8 (1.56)	7.2 (2.10)	2.7 (1.30)	0.9 (0.63)	0.5 (0.40)	0.7 (0.52)	0.4 (0.33)	1.7 (0.99)	1.0 (0.69)	1.1 (0.74)	0.8 (0.58)
Weed free	-	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Weedy		33.2 (3.53)	13.6 (2.68)	24.8 (3.24)	11.4 (2.51)	2.1 (1.12)	1.5 (0.91)	1.7 (0.99)	1.3 (0.83)	4.1 (1.62)	3.2 (1.43)	3.1 (1.41)	2.9 (1.36)
S.Em±		0.036	0.025	0.015	0.020	0.033	0.035	0.300	0.033	0.029	0.044	0.032	0.032
LSD(P=0.05)		0.100	0.070	0.040	0.058	0.094	0.100	0.088	0.095	0.086	0.120	0.093	0.093

Transformed values in parenthesis

Table 2: Nitrogen, Phosphorus and potassium uptake (Kg ha^{-1}) by crop at 60days stage and at harvest

Treatments	Rate g a.i. ha^{-1}	Nitrogen				Phosphorus					Potassium		
		60 days		harvest		60 days		harvest			60 days	harvest	
		I	II	I	II	I	II	I	II	I	II	I	II
Fenoxaprop p-ethyl	40	18.52	22.64	97.23	108.40	5.98	7.80	21.87	22.15	17.26	22.10	89.72	95.42
Fenoxaprop p-ethyl	60	20.76	25.47	109.37	117.53	7.08	9.32	24.66	26.58	19.95	25.32	96.35	103.16
Fenoxaprop p-ethyl	80	26.18	29.73	121.82	124.76	9.02	10.54	28.24	30.95	25.12	28.35	102.87	107.73
Fenoxaprop p-ethyl	90	26.78	31.26	123.31	128.92	9.23	11.12	30.02	33.21	25.84	30.44	105.64	119.22
Fenoxaprop p-ethyl + Isoproturon	30+500	21.23	26.85	107.05	113.83	7.38	9.35	25.89	27.75	20.23	26.35	102.21	106.97
Fenoxaprop p-ethyl + Isoproturon	40+500	25.92	30.96	124.31	129.06	8.96	10.68	29.97	32.86	25.38	29.10	108.49	118.58
Fenoxaprop p-ethyl + Isoproturon	50+500	27.34	32.58	127.05	132.42	9.49	11.37	30.65	34.43	26.15	31.48	112.82	123.56
Isoproturon	1000	22.56	25.97	114.56	122.77	8.00	9.76	28.06	31.36	20.78	27.02	102.28	108.36
Weed free	-	29.82	33.45	136.40	145.24	10.14	12.06	32.42	35.54	27.22	33.55	115.17	126.98
Weedy		13.65	16.24	58.26	66.60	5.06	6.37	14.16	15.32	13.96	17.14	65.45	25.67
S.Em$\pm$		0.55	0.65	7.30	1.21	0.25	0.45	0.61	0.64	0.23	0.50	0.96	1.16
LSD(P=0.05)		1.60	1.89	21.18	3.53	0.72	1.30	1.74	1.85	0.67	2.77	2.77	3.36

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