G- Journal of Environmental Science and Technology

(An International Peer Reviewed Research Journal)

Available online at http://www.gjestenv.com

Performance of different weed control chemicals for control of little seed canary grass (*Phalaris minor* Retz.) in wheat crop, India

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ARTICLE INFO

Received: **06 Aug 2015**
Revised : **10 Sept 2015**
Accepted: **06 Oct 2015**

***Key words*:**
Weed control chemical, Fenoxaprop-p-ethyl, Metribuzin, Metsulfuron methyl, *Phalaris minor*, Weed, Wheat, Grain yield

ABSTRACT

Field experiment was conducted during 2005-06 and 2006-07 to evaluate the effect of Fenoxaprop-p-ethyl, Metribuzin and Metsulfuron -methyl for control of little seed canary grass in wheat crop. The pooled analysis of two years data revealed that little seed canary grass (53.52%) was the most dominant weed in the experimental field of wheat crop. Fenoxaprop-p-ethyl showed the most potent direct effect and caused maximum decrease in little seed canary grass *(P. minor)* population and its dry weight production in comparison to other chemicals as evidenced by its relative population (8.17 plants/m^2) at harvest of the wheat crop due to its selective nature. Fenoxaprop-p-ethyl at 90 g.a.i.ha^{-1} treated plot lowered the growth characters of *Phalaris minor* like plant height, number of tillars, leaf area and dry weight production as compared to metribuzin, metsulfuron-methyl and weedy check. The dry weight production of *P. minor* was reduced from 70.53 g m^{-2} in weedy check to 9.96 gm^{-2} in fenoxaprop-p-ethyl at 90 g.a.i.ha^{-1} treated plot. Metribuzin at 70g a.i.ha^{-1} was the second best chemical treatment in reducing the population and dry weight production of P. minor followed by metsulfuron-methyl at 4.0 g.a.i.ha^{-1}. Fenoxaprop-p-ethyl at 90ga.i.ha^{-1} provided excellent control of little seed canary grass *(P. minor)* and produced effective tillers and grain yield of wheat in comparison to other weed control chemicals.

1) INTRODUCTION

Wheat (*Triticum aestivum* L.) is major food crop of India, grown mainly in the northern part of India, occupying second position in area and production of food grains. Wheat crop is commonly infested with grassy and broadly weeds, which cause yield loss to the tune of 30-50% [1]. Little seed canary grass (*Phalaris minor* Retz.) is the grassy weed of field wheat and it heavy infestation results in extensive crop yield and revenue losses. Yield losses especially with the infestations of *P. minor* alone are estimated from 25-50% and under very severe infestation the losses may go upto 80% and even more [2]. Heavy infestation of *P. minor* and other weeds has become a serious problem for increasing sustaining productivity of wheat. Due to the morphological similarity, this weed escapes manual weeding and hence its control through herbicides has been a popular option amongst farmers. Increased cost of manual weeding, its poor efficiency and non-availability of labour during critical periods also made herbicides very attractive for weed control in wheat crop [3]. Use of herbicide offers economic and efficient control of weed from the very beginning, providing the crop better establishment and competitive ability [4]. Fenoxaprop-p-ethyl at 80g ha^{-1} provided effective control of *P.minor* and resulted 28% more grain yields of wheat [5]. In view of above facts, experiment was planned to study the effect of different weed control chemicals (fenoxaprop-p-ethyl, metsulfuron methyl and metribuzin) against little seed canary grass and find out the most suitable herbicide for the control of little seed canary grass *(P. minor*) and other weeds in wheat crop.

2) MATERIALS AND METHODS

The field experiment was conducted during winter (rabi) seasons of 2005-06 and 2006-07 at Kargaina village, in Bareilly district. The soil of the experiment was sandy clay loam in texture, medium in organic carbon (0.60 and 0.56%), available Nitrogen (240 and 224.4 kg kg/ha), available Phosphorus (16.45 and 21.20 kg/ha) and available Potassium (201and 224 kg/ha) with pH 7.4 and 7.5 during 2005-06 and 2006-07, respectively.

Sowing of wheat variety PBW 343 was done on 25 November 2005 and 2006 with row spacing of 20 cm. A constant seed rate per plot @ 100kg/ha was used during both the years. Crop was raised by applying fertilizers 120kg N, 60kg P_2O_5 and 40kg K_2O per hectare through urea (46% N), single super phosphate (16% P_2O_5) and muriate of potash (60% K_2O) respectively. Half of nitrogen and whole of phosphorus and potasium were applied just before sowing and mixed in the

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Table 1: Effect of different weed control chemicals on population and dry weight production of little seed canary grass (*P. minor)* and total other weeds in wheat field.

Treatment	Dose g a.i./ha.	Population of *P. minor* per m^2			Population of total other weeds per m^2			Dry weight production of *P. minor* (g m^{-2})			Dry weight production of total other weeds (g m^{-2})		
		2005-06	2006-07	Pooled	2005-06	2006-07	Pooled	2005-06	2006-07	Pooled	2005-06	2006-07	Pooled
Fenoxaprop-p-ethyl	90	9.33	7.00	8.17	11.33	10.00	10.67	16.05	10.03	13.04	16.46	18.71	17.59
Metsulfuron-methyl	70	14.66	13.33	14.00	12.00	11.67	11.84	17.87	17.61	17.74	20.83	19.96	20.40
Metribuzin	4.0	10.33	11.00	10.67	12.67	8.33	10.50	18.25	15.76	17.01	17.09	15.92	16.51
Weed free	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weedy (control)	-	46.00	44.33	45.17	42.33	36.33	39.33	89.97	80.05	85.01	86.86	78.76	82.81
S.Em.±	-	1.53	1.77	0.61	1.74	1.55	2.26	1.49	1.95	2.11	1.15	1.43	1.94
CD at 5%	-	4.99	5.76	2.41	5.68	5.06	8.85	4.86	6.38	8.25	3.76	4.67	7.59

Table 2: Effect of different weed control chemicals on plant height, tillers/plant, leaf area and dry weight of little seed canary grass (*P. minor)* in wheat field.

Treatment	Dose g a.i./ha.	Plant height (cm) of *P. minor*			Number of tillers per plant of *P. minor*			Leaf area (cm^2) of *P. minor*			Dry weight of *P. minor* (g m^{-2}) at 90 DAS		
		2005-06	2006-07	Pooled	2005-06	2006-07	Pooled	2005-06	2006-07	Pooled	2005-06	2006-07	Pooled
Fenoxaprop-p-ethyl	90	74.26	78.26	76.26	1.06	0.73	0.90	20.51	18.36	19.44	12.41	7.50	9.96
Metsulfuron-methyl	70	77.56	80.76	79.16	1.53	1.23	1.38	21.59	21.11	21.35	15.42	12.41	13.92
Metribuzin	4.0	75.43	79.40	77.42	1.13	1.00	1.07	21.67	18.75	20.21	15.33	10.16	12.75
Weed free	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Weedy (control)	-	89.46	93.83	91.65	4.43	3.53	3.98	31.29	31.52	31.41	75.30	65.76	70.53
S.Em.±	-	1.10	0.99	0.89	0.12	0.99	0.17	0.58	0.93	0.67	1.20	1.30	1.74
CD at 5%	-	3.60	3.24	3.49	0.41	0.32	0.67	1.89	3.04	2.65	3.93	4.24	6.80

Table 3: Effect of different weed control chemicals on number of productive tillers/ plant and Grain yield (kg/ha) of wheat

Treatment	Dose g a.i./ha.	Number of productive tillers/ plant			Grain yield (kg/ha)		
		2005-06	2006-07	Pooled	2005-06	2006-07	Pooled
Fenoxaprop-p-ethyl	90	4.83	5.33	5.08	4988	5052	5020
Metsulfuron-methyl	70	4.46	5.16	4.81	4495	4655	4575
Metribuzin	4.0	4.63	5.23	4.93	4589	4743	4666
Weed free	-	5.13	5.46	5.30	5439	6018	5729
Weedy (control)	-	3.60	3.76	3.68	3502	3451	3477
S.Em.±	-	0.16	0.21	0.10	135	213	119.13
CD at 5%	-	0.52	0.70	0.42	442	695	465.81

soil manually (Basal dressing). The remaining quantity of nitrogen was top dressed after first irrigation at the crown root initiation stage of wheat. The remaining irrigations were scheduled based on critical growth stages of wheat.

The experiment was laid out in randomized block design with three replications. The plot experiment size was 3x2 metre square during both years.Treatments consisted fenoxaprop-p-ethyl (selective herbicides) at 90 g a.i./ha, metsulfuron methyl (herbicide) at 4.0 g a.i./ha metribuzin (weedicide) at 70g a.i./ha, weed free and weedy check. All the chemicals were applied 35 days after sowing (DAS) using hand held sprayer machine at spray volume of 450 litres per hectare. A quadrate 50 x 50cm (2500 cm^2) was used to record the observation from the sampling area of the each plot and count was expressed as number of little seed canary grass (*Phalaris minor*) per m^2. The dry weight of little seed canary grass was recorded as g/m^2 at 120 days after sowing from each plot of the experiment. Species wise number of grasses/weeds was recorded from two places in each plot at 120 DAS. Plant height, number of tillers/m^2 and leaf area of *P. minor* were recorded at 120 DAS during both the years. The data on number of tillers/m^2 and grain yield (kg) of wheat were recorded at harvest and subjected to statistical analysis.

3) RESULT AND DISCUSSION

Weed Population: Little seed canary grass (*Phalaris minor*) was the major weed of wheat field in the control (Weedy) plots during both the years. Control plots were infested with *P. minor* (52.08 and 54.96%), *Avena fatua* (9.06 and11.97%), *Chenopodium album* (15.46 and 13.64%), *Melilotus indica* (8.29 and10.33%) and other weeds (15.11 and 9.10%), like *Cynodon dactylon*, *Lathyrus aphaca*, *Vicia hirsuta*, *Fumaria parviflora*, *Anagallis arvensis*, *Medicago denticulata*, *Coronopus didymus* during both the years of 2005-06 and 2006-07. On pooled basis, percent population of little seed canary grass or *P. minor* (53.52%) was also highest in comparison to total other weed species (46.48%) at harvest of the wheat crop in weedy check plots. This clearly indicate that little seed canary grass was the most dominant weed species in the experimental field of wheat crop in comparison to all other weed species during both the years and in pooled results. Singh et al. [6] reported that *P. minor* was the most dominating weed species constituting 93% of total weed flora in weedy check plots.

Effect of chemicals on weeds: All the weed control chemicals significantly reduced the population and dry weight production of little seed canary grass (*P. minor*) and other weeds during both the years and in pooled results (**Table-1**). The reduction in the population of little seed canary grass and total other weeds by chemical treatments were due to its phytotoxic effects on weed species. Chemical treatments were effective in reducing the growth characters of little seed canary grass (*P. minor*) like plant height, number of tillers /plant, leaf area and dry weight production over weedy check during both the years and in pooled results (**Table-2**). Maximum inhibitory effect was recorded in case of fenoxaprop-p-ethyl 90g a.i./ha followed by metribuzin (70g a.i./ha) and metsulfuron methyl (4.0g a.i./ha) treatments during both the years. The excellent performance of fenoxaprop-p-ethyl in the present study appeared to be due to better control of grassy weeds (*P. minor*, *Avena fatua*, *Cynodon dactylon*),which constituted more than 64% of the total weed flora. Dhaliwal et al. [7] also reported that fenoxaprop (100 ml/ha) and Metribuzin (160g/ha) reduced the morphological characters and dry weight production of Phalaris minor. Brar et al. [8] reported that the bioefficacy of fenoxarprop-p-ethyl at 80-120g/ha provided nearly 100% control of *P. minor*. Application of metribuzin and fenoxaprop-p-ethyl significantly reduced the dry matter production in *P. minor* and other broad leaved weeds [9].

Effect of chemicals on wheat crop: Chemical treatments resulted in significant improvement in number of tillers and grain yield of wheat. The highest number of tillers and grain yield of wheat was recorded under weed free treatment followed by chemical treatments and control. Among chemicals, maximum number of tillers and grain yield of wheat was recorded in case of the application of fenoxaprop-p-ethyl followed by metribuzin and metsulfuron-methyl application during both the years of 2005-06 and 2006-07 and in pooled results (**Table-3**). The reduced competition for nutrients, water and light due to chemical application, might be reason for better wheat plants growth and increased yield levels. Fenoxaprop at 100 g/ha produced wheat grain yield at par with weed -free treatment [10]. All the chemical treatments significantly reduced the little seed canary grass (*P. minor*) and total other weeds and increased the grain yield of wheat over weedy check during both the years.

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