Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(2): 1462-1464
Received: 10-01-2020
Accepted: 12-02-2020

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Effect of broad leaf herbicides on density and dry weight of weeds, yield and yield attributes of irrigated wheat

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Abstract
Experiment was carried out during *rabi* 2016-17 under All India co-ordinate Wheat & Barley Improvement Project, at BTC, College of agriculture and Research Station Sarkanda, Bilaspur (C.G.). The highest yield was obtained under weed free situations (45.98 q/ha). A close comparison among herbicides shows better performance of Metsulfuron + carfentrazone + surfactant (44.95 q/ha) followed by Halauxifen methyl + florasulam+ carfentrazone + surfactant (44.56 q/ha) and 2,4-D E + Carfentrazone (42.02 q/ha). Gain in yield was due to better weed control as a result higher number of earheads/sq.m. This treatment also reduced weed number and dry weight to great extent a compared to other treatments.

Keywords: Broad leaf herbicides, density, dry weight, weeds, yield, yield attributes, irrigated wheat

Introduction
Wheat (*Triticum aestivum* L.) is the second most important staple food after rice crops worldwide and in India. Its production increased from 11.0 million tons during 1960-61 to 97.44 million metric tons during 2016-17 (Project Director, DWR, Karnal: Progress report, 2016-17). Weeds account for about one third of total losses caused by all pests. Weeds not only reduce the yield but also make the harvesting operation difficult. Therefore, for sustaining food grain production to feed ever- increasing population and ensuring food security, effective weed management is very essential.

Weed infestation during early stages of crop growth is one of the major factors responsible for lower wheat productivity. The short stature of new dwarf varieties coupled with higher fertilizers and irrigation requirements creates favourable ecological conditions for weed growth. Weeds compete with crop for sunlight, space, nutrients and moisture. Studies conducted in Palampur revealed that uncontrolled weed growth depleted 83.4, 18.7 and 80.8 kg ha^{-1} of nitrogen, phosphorus and potassium, respectively which was 47.1, 11.5 and 55.21 kg ha^{-1} higher than the total uptake of these nutrients by wheat crop (Kumar *et al.*, 2005).

Moreover, weeds also increase the cost of cultivation, reduce input efficiency, interfere with agricultural operations, impair quality, act as alternate hosts for several insects-pests, diseases, affect aesthetic look of the ecosystem as well as affect human and cattle health. Wheat crop is badly infested with broad leaved weeds like *Parthenium hysterophorus*, *Portulaca oleracea*, *Euphorbia mollis*, *Amaranthus viridis*, *Convolvulus arvensis*, *Commelina benghalensis*, *Chenopodium album* etc. In India presence of weeds; in general reduces crop yields by 31.5 and 22.7 % in *rabi* and summer season and 36.5% in *kharif* season and in some cases can cause complete devastation of the crop (Anonymous, 2007) [2].

The yield per unit area obtained in our country is far less than the yield of developed countries of the world. Besides various causes of low grain yield per unit area, presence of weeds is a key limiting factor towards higher wheat yields. Weeds compete with crop for light, nutrient, water and carbon dioxide. Rao (2000) reported that reduction in crop yield has a direct correlation with weed competition. mentioned that herbicides would continue to be a key component in weed management in wheat. Moreover, they observed that weeds consume three to four times more nitrogen, potassium and magnesium than weed free crop.

Weed management is one of the major input costs of production. In wheat the earlier period up to 30-40 days is critical period for crop weed competition. Weeds can be controlled by adopting different methods. However, each weed control method has its own limitations. Mechanical methods are laborious and time consuming, besides weeds with similar morphological characters like crops are likely to be escaped. Herbicides have benefited the agricultural community in many ways. Heavy reliance on herbicides creates an environment

favourable for weed resistance to herbicides, weed population shifts and off-site movements of herbicides (Rao and Nagmani, 2010) [2]. A number of weed species that were once susceptible to and easily managed by certain herbicides have developed resistance with time. These weeds are no longer controlled by application of previously effective herbicides. As a result the repeated use of a specific type of herbicide on a same piece of land has developed resistance in some type of weeds to these chemicals. Extensive use of iso-proturon over many years has led to the evolution of resistance in Phalaris *minor* in north-west India. Therefore, continued use of iso-proturon after the development of resistance resulted in heavy build up of *Phalaris minor* population and caused heavy yield losses in wheat (Chokkar and Malik, 2002) [7]. Therefore it is the need of the time that we should use newer herbicides in rotation or in combination with the herbicides earlier in use.

Material and methods

Experimental soil was clayey in nature (vertisol), neutral in reaction (pH7.1), and low in available nitrogen, medium in available phosphorus and high in available potassium content. The eleven weed control treatments were i) Halauxifen-methyl ester+Florasulam 40.85% WG+surfactant Polyglycol 26-2 N (12.76 g a.i +750 ml./ha); ii) Metsulfuron methyl 20 WG + surfactant (4.0 g a.i +625 ml./ha), iii) Carfentrazone 40DF (20.0 g a.i./ha); iv) 2,4-D Na 80 WP (500 g a.i./ha); v) 2,4-D E 38 EC (500 g a.i./ha); vi) Metsulfuron+carfentrazone +surfactant (4.0 g+20 g+625 ml/ha); vii) 2,4-D Na + Carfentrazone (400+20 g a.i./ha); viii) 2,4-D E + Carfentrazone (400+20 g a.i./ha); ix) Halauxifen methyl + florasulam+ carfentrazone + surfactant (10.21+20 g a.i.+750 ml /ha); x) Weedy check and xi) Weed free. Broadleaved herbicides were applied at 30-35 days after sowing. A blanket dose of clodinafop 60 g/pinoxaden 50 g/fenoxaprop 100 g/ha was applied about 5 days before or after the broad leaf herbicide application to control grassy weeds. Experiment was conducted in Randomized Block Design with three replications. Wheat genotype namely HI 1544 was taken, experiment was sown in 21th November 2016 and harvested at 28th March 2017. Observations on weed density and dry weight were recorded at 60 and 90 days after herbicide spray. For irrigation and fertilization, the recommended package of practices is applied.

Result and Discussion

Weed flora of wheat differs from field to field depending on environmental conditions, irrigation, fertilizer use, soil type, weed control practices and cropping sequences. The predominant broad leaf weeds associated with wheat in experimental field are *Chenopodium album* L., *Melilotus alba*, *Euphorbia hirta*., *Convolvulus arvensis* L., *Amaranthus* viridi., *Anagallis arvensis* L., *Convolvulus arvensis* L., *Medicago denticulate, Melilotus alba.and flavaria countriarva.*Among this all broad leaf weeds *Chenopodium album* L., and *Medicago denticulate* were occurs in highest number as compared to others, among grassy weeds, *Phalaris minor* and among broad-leaved weeds *Rumex dentatus* L. and *Medicago denticulta* are of major concern in irrigated wheat under rice-wheat system in India (Singh *et al.*, 1995; Chhokar *et al.*, 2006) [10, 6].

The highest yield was obtained under weed free situations (45.98 q/ha). A close comparison among herbicides shows better performance of Metsulfuron + carfentrazone + surfactant (44.95 q/ha) followed by Halauxifen methyl + florasulam+ carfentrazone + surfactant (44.56 q/ha) and 2,4-D E + Carfentrazone (42.02 q/ha). Gain in yield was due to better weed control as a result higher number of earheads/sq.m. and 1000 grain weight (g), for control of broad-leaved weeds in wheat, three major herbicides used are metsulfuron, 2,4-D and carfentrazone (Chhokar *et al*., 2007) [4].

This treatment also reduced weed number and dry weight to great extent as compared to other treatments. In wheat, chemical weed control is preferred over manual and mechanical methods because of its better efficiency along with less cost and time involvement. Herbicides cause no mechanical damage to the crop that happens during manual weeding. Moreover, the control is more effective as the weeds even within the rows are killed, which invariably escape, because of morphological similarity to crop, during mechanical control. (Rajendra singh chhokar 2006) [6]
proper application method. Balyan *et al.*, 1988 observed that control of weeds was excellent, when isoproturon was applied up to 35 DAS (Days after sowing)and poor control was observed with delay in application. Similarly, Malik, *et al.*, 1984 reported better control of wild oat with isoproturon when applied 25 DAS compared to its application at 35 DAS. Herbicides effective against isoproturon resistance biotypes of P. minor areulfosulfuron, clodinafop, fenoxaprop, tralkoxydim, pendimethalin,Atlantis and pinoxaden. Sulfosulfuron, Atlantis and pendimethalin are effective against both grass and non-grass weeds, whereas, clodinafop, fenoxaprop, tralkoxydim and pinoxaden are specific to grasses. However, sulfosulfuron and pendimethalin are not effective against *Rumex dentatus* and *Avena ludoviciana*, respectively. For control of broad-leaved weeds in wheat, three major herbicides used are metsulfuron, 2,4-D and carfentrazone (Chhokar *et al*., 2007) [4]. For control of broad-leaved weeds, 2,4-D has been used for a long time, however, the application of 2,4-D at inappropriate time as well as on sensitive cultivar can lead to yield reduction due to malformation (Pinthus and Natowitz, 1967; Bhan *et al*., 1976). In addition, 2,4-D butyl ester application often results in injury to adjacent sensitive broadleaf crops, due to its volatilization and solution drifting (Zhang *et al*., 2005) as a result it is less preferred by the growers.

Table 1: Effect of herbicides on yield and yield attributes in irrigated wheat.

Treatments	Dose g a.i./ha	Ear head/ sq. m.	Grains/ Ear head	1000 Grain weight, g.	Yield, q/ha
Halauxifen + Florasulam + S	12.76	240	36.42	38.32	33.28
Metsulfuron + S	4	269	33.39	42.37	38.21
Carfentrazone	20	293	31.67	43.26	39.12
2,4-D Na	500	248	35.61	40.05	35.15
2,4-D E	500	307	29.87	41.26	37.29
Metsulfuron + Carfentrazone + S	4+20	338	28.83	46.06	44.95
2,4-D Na + Carfentrazone	400+20	303	30.70	44.21	40.80
2,4-D E + Carfentrazone	400+20	314	30.76	43.56	42.02
Halauxifen+Florasulam+	10.21+20	324	30.08	45.94	44.56

Carfentrazone+S					
Weedy check	-	232	35.87	37.42	30.65
Weed free	-	360	27.30	46.86	45.98
CD (0.05)		31.35	8.12	5.48	5.50

Table 2: Effect of herbicides on weed population and weed dry weight in irrigated wheat.

Treatments	Dose g a.i./ha	Weed Population, No./sq. 60 days after spray	Weed Dry Weight, g/sq. m. 90 days after spray
Halauxifen + Florasulam + S	12.76	5.26(27.4)	2.65(7.0)
Metsulfuron + S	4	4.82(22.8)	2.70(6.8)
Carfentrazone	20	4.27(17.9)	3.07(9.1)
2,4-D Na	500	4.87(23.4)	2.66(7.2)
2,4-D E	500	4.74(22.0)	2.79(7.6)
Metsulfuron + Carfentrazone + S	4+20	3.78(14.0)	1.65(2.3)
2,4-D Na + Carfentrazone	400+20	4.82(22.8)	3.37(11.1)
2,4-D E + Carfentrazone	400+20	4.37(18.7)	2.73(7.1)
Halauxifen+Florasulam+ Carfentrazone+S	10.21+20	4.17(17.0)	2.31(5.2)
Weedy check	-	3.46(11.5)	5.17(26.4)
Weed free	-	18.01(324.0)	0.71(0.0)
CD (0.05)		0.71	0.76

*Original values in parenthesis and square root transformed (√X+0.5) value used for statistical analysis

References

1. Agasimani CA, Shanwad UK, Arvindkumar BN, Shivamurthy SD, Surwenshi A, Jalageri BR. Integrated weed management (IWM): A long term case study in groundnut-wheat cropping system in northern Karnataka. Res. J. Agric. Sci. 2010; 1(3):196-200.
2. Anonymous. A.N. and Nagamani, A. 2010. Integrated Weed Management in India Revisited. Indian J. Weed Sci. 2007; 42(3, 4):123-135.
3. Anonymous. PD, Report of All India Coordinated Wheat & Barley Improvement Project 2016-17, Directorate of Wheat Research, Karnal, India. 2012, 4.
4. Chhokar RS, Sharma RK, Pundir AK, Singh RK. Evaluation of herbicides for control of *Rumex dentatus*, *Convolvulus arvensis* and Malva parviflora. Indian J. Weed Sci. 2007; 39: 214-218.
5. Chhokar RS, Sharma RK, Chauhan DS, Mongia AD. Evaluation of herbicides against *Phalaris minor* in wheat in north-western Indian plains. Weed Res. 46: 40-4
6. Chhokar, R. S., Sharma, R. K. and Sharma, Indu, (2012), Weed Management strategies in wheat- A review. Journal of Wheat Research. 2006; 4(2):1-21
7. Chhokar RS, Malik RK. Isoproturon resistant little seed canary grass (*Phalaris minor*) and its response to alternate herbicides. Weed Technol. 2002; 16:116-123.
8. Kumar *et al*., from Palampur, Himachal Pradesh concluded that weeds caused 55.7 % reduction in wheat grain yield, 2010
9. Panwar RS, Malik RK, Balyan RS, Rathi SS. Influence of tank mixture of isoproturon and fluroxypyr on control of weeds in wheat (*Triticum aestivum* L.). Indian J Agron. 1996a; 14(4):577-580.
10. Singh S, Malik RK, Balyan RS, Singh S. Distribution of weed flora of wheat in Haryana. Indian J Weed Sci. 1995; 27:114-121.