Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP2: 25-28

Janmejay Sharma
RVSKK, Zonal Agriculture Research station, Morena, Madhya Pradesh, India

SS Tomar
RVSKVV, Gwalior, Madhya Pradesh, India

Ajay Singh
RVSKVV, College of Agriculture, Gwalior, Madhya Pradesh, India

RL Rajput
RVSKVV, Gwalior, Madhya Pradesh, India

Sandeep Singh Tomar
RVSKVV, Zonal Agriculture Research station, Morena, Madhya Pradesh, India

Vijay Gupta
ITM University Gwalior, Madhya Pradesh, India

Correspondence
Janmejay Sharma
RVSKK, Zonal Agriculture Research station, Morena, Madhya Pradesh, India

National Conference on Conservation Agriculture
(ITM University, Gwalior on 22-23 February, 2018)

Effect of fertility levels and weeds management practices on weeds dynamics, yield and economics of wheat (*Triticum aestivum* L.)

Janmejay Sharma, SS Tomar, Ajay Singh, RL Rajput, Sandeep Singh Tomar and Vijay Gupta

Abstract
A field experiment was conducted during winter season of 2010-11 and 2011-12 at Research farm College of Agriculture, Gwalior. The result revealed that unchecked weed growth caused 40.16% reduction in grain yield of wheat. Amongst herbicides, application of pinoxaden + carfentrzone-ethyl recorded lowest population of weeds and weeds dry weight and gave highest grain (4889 kg/ha) and straw yield with maximum net return and B: C ratio. Maximum grain yield was obtained with weed free (4927 kg/ha).

Keywords: Fertility levels, herbicides, weed control efficiency, Economics and wheat

Introduction
Wheat [*Triticum aestivum* (L.)] is one of the most important cereal crop because it is the staple food of the people of India. There has been tremendous increase in area, production and productivity of this crop during the green revolution phase of Indian agriculture in India. It occupies second position both in terms of area and production in the world. Among various factors responsible for low yield, weed infestation and nutrient management are of supreme importance. Weed competes with crop plants for water, nutrients, space and solar radiation resulting in reduction of yield by 20 to 50% (Bhan, 1998) [3]. Nitrogen and phosphorus are essential for normal growth and development of plants. Application of phosphorus produces primordial for reproductive stage and enhances root proliferation **(**Li *et al*., 2003) [9]. Nitrogen promotes vegetative growth and photo- synthetic activities in wheat and increases the water use efficiency of wheat. But our soils are deficient in these nutrients and we have to apply these nutrients in the form of fertilizer. In India, nutrient use efficiency is very low. Among various causes of low nutrient use efficiency i.e. improper dose, time and method of fertilizer application, inadequate soil moisture status, weed infestation, weed crop competition is of supreme importance. Cultural, mechanical and chemical methods are commonly used for controlling weeds. Unavailability of manual labour in peak season and unfavorable weather do not permit timely control of weeds. Therefore, weed control by mechanical means alone is not feasible. Hand or manual weeding though very effective and commonly adopted in India is expensive, tedious, time consuming and many a times become uneconomic. Further, manual weeding is not feasible in all situations and had many problems with varying crops and soil types. Chemical weed control is an important alternative. Herbicide have shown to be beneficial and very effective means of controlling weeds in wheat because they are quite effective and efficient (Azad *et al.*, 1997) [2]. Keeping these facts in view, the present investigation is being proposed.

Materials and methods
A field experiment was conducted during winter season of 2010-11 and 2011-12 at Research farm College of Agriculture, Gwalior. The soil of the experimental field was sandy clay loam in texture and neutral in reaction (pH 7.6) with 0.42 organic carbon content, analyzing low in available N (164.5 kg/ha), medium P (14.7 kg/ha) and K (235.5 kg/ha) contents having 16.2 exchangeable cation and 0.41 mmhos/cm electrical conductivity. Fertility status of experimental site was homogenous. Variations in the growth and yield of crop were mainly

due to effect of the treatments tested. The experiment was laid out in split plot design with 3 replications having 2 fertility levels viz. 80:50:30 kg NPK/ha (100% RDF) and 100:62:37 kg NPK/ha (125% RDF) and 13 weed control treatments viz. pinoxaden 50g ai/ha, metsulfuron-methyl 4g ai/ha, pinoxaden + carfentrazone-ethyl 50+20g ai/ha, pinoxaden + metsulfuron-methyl 50+4g ai/ha, pinoxaden + 2,4-D 50+500g ai/ha, pinoxaden fb carfentrazone-ethyl 50 & 20g ai/ha, pinoxaden fb metsulfuron-methyl 50 & 4g ai/ha, pinoxaden fb 2,4-D 50 & 500g ai/ha, carfentrazone-ethyl 20g ai/ha, idosulfuron + mesosulfuron(pre-mix) 400g /ha, 2,4-D 500g ai/ha, weed free (two hand weedings at 28 and 45 DAS) and weedy check. The total treatment combination was 26. The wheat variety MP 4010 was sown at 22.5 cm apart rows with a seed rate of 125 kg/ha on first week of December and harvested on first fortnight of April during both the experimental years.

Results and discussion

Effect on weeds

The population of narrow weed species, *viz*. *Phalaris minor* and *Cyperus rotundus* and broad leaf weeds, *viz*., *Chenopodium album, Anagallis arvensis, Convolvulus arvensis* and *Fumeria parviflora* and *Melilotus indica* were reduced drastically with use of herbicides. These findings supported the findings of Narial *et al.* (2007) [12] and Meena and Singh (2011) [10] who reported that all the weed control treatments caused significant reduction in the density of total weeds over weedy check. Lowest weed population of weeds was recorded in weed free treatment while highest in weedy check, These results are in close agreement with Rathi *et al.* (2008) [15] who had reported lowest weed density in weed free plot.

Among the herbicides, pinoxaden + carfentrzone-ethyl, pinoxaden + metsulfuron-methyl, pinoxaden + 2,-D, idosulfuron + mesosulfuron and pinoxaden fb carfentrazone-ethyl were found effective controling broad leaf as well as narrow leaf weeds (Table-1). These results are in line with Kaur *et al.* (2007) in respect of idosulfuron + mesosulfuron. Katara *et al.* (2012) [7] reported significantly minimum population of narrow and broad leaf weeds with the application of pinoxaden + metsulfuron-methyl, pinoxaden + carfentrazone-ethyl. In case of pinoxaden, it was found effective in suppressing narrow leaf rather than broad leaf weeds, whereas carfentrazone-ethyl, metsulfuron-methyl as well as 2,4-D found effective in controlling broad leaf weeds. The superiority of new herbicide like pinoxaden in respect of controlling the weed especially narrow leaf was reported by Yadav *et al.* (2009a) [17]. In respect of broad leaf weeds carfentrzone-ethyl, metsulfuron-methyl and 2,4-D was also reported effective by Chopra *et al.* (2008) [4] and Yadav *et al*. (2009b) [18].

Total narrow and broad leaf weeds as well as total weeds density significantly increased due to fertility levels. The maximum population of narrow and broad leaf weeds as well as total weeds was significantly higher in high fertility level as compared with low fertility level. Increase in fertilizer levels the availability of nutrient to weeds may be enhanced due to reduction in the crop weed competition for nutrients. The better nutrient availability status in soil encourages the germination of more weeds. These results are in line with the findings of Das and Yaduraju (1999) [5], and Nadeem *et al.* (2006) [11] who reported significant increase in weed density with increased fertilizer levels.

Dry weight of weeds significantly influenced due to weed control treatments and fertility levels (Table -1). In respect of weed management practices, all weed control treatments gave lower weed dry weight compared with untreated check. The significantly minimum dry weight of weeds was noted in weed free plot due to least population of narrow and broad leaf weeds, while highest dry weight of weeds was recorded in weedy check. It might be due to more density and unsuppressed weed growth under untreated check plot. A minimum dry weight of weeds in weed free plot has also been reported by Nayak *et al.* (2003) [13]. Pinoxaden + carfentrazone-ethyl, pinoxaden + metsulfuron-methyl, pinoxaden + 2,4-D gave lowest dry weight of weeds among herbicidal treatments and were comparable to weed free plot. All these herbicidal treatments demonstrated a very effective mortality of broad as well as narrow leaf weeds resulting decline in dry matter accumulation and proved best of all the herbicidal treatments for weed control in wheat field. Similar results were also obtained by Katara *et al.* (2012) [7] in case of combined application of pinoxaden with metsulfuron methyl or carfentrazone-ethyl. The significantly maximum dry weight of weeds was obtained with application of higher fertilizer dose. This is possible due to higher dose of fertilizer accelerated density of weeds and proportionally brought higher dry weight of weeds. The increase in dry weight of weeds at higher level of fertilizer resulted from greater availability of nutrients, which helped in buildup of better vegetative growth. Similar finding have been reported by Das and Yaduraju (1999) [5].

Table 1 reveled that higher weed control efficiency was recorded in weed free (96.73%) followed by pinoxaden + carfentrazone-ethyl (95.85%), pinoxaden + metsulfuron-methyl (91.98%), pinoxaden + 2,4-D (91.13%) and idosulfuron + mesosulfuron (88.85%) and pinoxaden fb carfentrazone-ethyl (86.89%). The higher weed control efficiency under these treatments was reflected through to lower dry weight of weeds. These results are in tune with the finding of Katara *et al.* (2012) [7].

Weed index is indirectly related to the reduction in yield due to weed population and weed dry weight. Minimum reduction in grain yield of wheat (0.79%) due to weed competition was found in combined application of pinoxaden + carfentrazone-ethyl, which was followed by pinoxaden + metsulfuron-methyl (4.29%), pinoxaden + 2,4-D (5.01%), idosulfuron + mesosulfuron (5.66%) and pinoxaden fb carfentrazone-ethyl (6.19%). The infestation of weeds throughout the crop growth period caused 40.16% reduction in grain yield of wheat. Drastic reductions in grain yield of wheat due to higher weed competition in weedy check have been reported by Khokhar and Nepalia (2010) [8].

Effect on yield

All the weed control treatments significantly increased the grain and straw yield over weedy check as also reported by Sharma *et al.* (2002) [16]. The highest grain and straw yield recorded in weed free plot while minimum in weedy plot. Among the herbicides, pinoxaden + carfentrazone-ethyl, pinoxaden + metsulfuron-methyl and pinoxaden + 2,4-D, recorded significantly higher grain as well as straw yield and were at par with weed free plot during both the years. However, pre-mix application of idosulfuron + mesosulfuron and sequential application of pinoxaden fb carfentrazone-ethyl were also statistically at par with weed free plot in respect of straw yield kg/ha (Table 2). Such superior treatments minimized weed-crop competition and saved more available environmental resources for crop plant that improved growth traits. The superiority of these treatments

over weedy check in increasing yield has also been reported by Khokhar and Nepalia (2010) [8].

In case of fertility levels, highest grain, straw were recorded with 125% RDF than 100% RDF. Higher dry matter accumulation resulted from heavy fertilization encouraged more mineral accumulation which favoured the development of tillers and formation of large number of grains which finally reflected in higher production. Similar results were also obtained by Rehman *et al*. (2010) [14].

Effect on economics

Of the different weed control treatments, tank-mix application of pinoxaden + carfentrazone-ethyl gave highest net return of Rs. 59736/ha closely followed by pinoxaden + metsulfuron-methyl, pinoxaden + 2,4-D, weed free, idosulfuron + mesosulfuron and pinoxaden fb carfentrzone-ethyl recording Rs. 57080, Rs. 56487, Rs. 55997, Rs. 55541 and Rs. 55370 per hectare, respectively (Table 2) These findings are in close agreement with previous finding of Ashrafi *et al*. (2009) [1] who reported that broad-spectrum (grasses + broad leaf) herbicides gave maximum net income in wheat. Minimum net return (Rs. 30188 /ha) was received in weedy check. Similarly, tank-mix application of pinoxaden + carfentrazone-ethyl performed the highest benefit: cost ratio of 3.92, whereas, minimum benefit: cost ratio was obtained in untreated weedy check. Next in decreasing order of benefit: cost ratio, treatment were, pinoxaden + metsulfuron-methyl, pinoxaden + 2,4-D, pinoxaden fb carfentrzone-ethyl and idosulfuron + mesosulfuron. All these treatments were most effective in weed control and recorded higher yield and weed control efficiency, and also higher benefit cost ratio. However, all herbicidal weed control treatments except alone application of carfentrazone-ethyl, metsulfuron-methyl and 2,4-D gave more benefit: cost ratio over weed free plot due to lower input cost. Similar finding were also reported by Jat *et al.* (2003).

Table 1: Effect of different fertility levels and weed management practices on weeds dynamics

Treatments Fertility levels	Narrow leaf weeds population/m²	Broad leaf weeds population/m²	Total weeds population/m²	Total dry weight of weeds (g/m²)	Weed control efficiency (%)	Weed Index (%)
100% RDF	1.13 (40.29)	1.05 (22.97)	1.46 (63.27)	31.31	-	-
125% RDF	1.26 (48.26)	1.22 (29.73)	1.60 (77.99)	45.33	-	-
S.E. m (d) ± C.D. (at 5%)	0.031 0.086	0.024 0.068	0.022 0.061	1.44 4.00	- -	- -
Weed management practices						
Pinoxaden	1.04 (11.25)	2.02 (104.75)	2.06 (116.00)	40.36	70.75	18.82
Metsulfuron-methyl	2.10 (126.75)	1.22 (16.08)	2.15 (142.83)	65.91	52.25	28.22
Pinoxaden + Carfentrazone-ethyl	0.57 (3.92)	0.63 (3.75)	0.86 (7.67)	5.78	95.85	0.79
Pinxaden + Metsulfuron-methyl	0.72 (6.00)	0.92 (8.33)	1.13 (14.33)	11.22	91.98	4.29
Pinoxaden + 2,4-D	0.78 (6.58)	0.97 (8.92)	1.17 (15.50)	12.79	91.13	5.01
Pinoxaden fb Carfentrazone-ethyl	0.88 (7.75)	0.99 (9.17)	1.22 (16.92)	18.52	86.89	6.19
Pinoxaden fb Metsulfuron-methyl	0.94 (9.42)	1.29 (19.08)	1.44 (28.50)	32.64	76.57	13.00
Pinoxaden fb 2,4-D	1.04 (11.17)	1.21 (16.00)	1.42 (27.17)	33.78	75.68	12.81
Carfentrazone-ethyl	2.08 (119.83)	0.80 (6.17)	2.10 (126.00)	53.80	61.15	24.84
Idosulfuron + Mesosulfuron	0.71 (5.67)	1.03 (10.25)	1.17 (15.92)	15.59	88.85	5.66
2,4-D	2.09 (125.50)	1.20 (15.33)	2.15 (140.83)	67.16	51.34	31.13
Weed free	0.42 (3.00)	0.42 (2.25)	0.67 (5.25)	3.16	97.73	-
Weedy check	2.14 (138.75)	2.09 (122.50)	2.41 (261.25)	137.43	-	40.16
S.E. m (d) ± C.D. (at 5%)	0.065 0.129	0.068 0.134	0.043 0.084	3.25 6.44	- -	- -

Data subjected to (Log x and Log X+1) transformation, and figures in parentheses are original values

Table 2: Effect of different fertility levels and weed management practices on yield and economics of wheat

Treatments Fertility levels	Gain yield (kg/ha)	Straw yield (kg/ha)	Net income (Rs./ha)	B: C ratio
100% RDF	4008	5984	47410	3.51
125% RDF	4400	6459	52825	3.69
S.E. m (d) ± C.D. (at 5%)	33 92	0.024 0.068	- -	- -
Weed management practices				
Pinoxaden	4000	6032	46341	3.32
Metsulfuron-methyl	3537	5435	39216	2.99
Pinoxaden + Carfentrazone-ethyl	4889	7051	59736	3.92
Pinxaden + Metsulfuron-methyl	4716	6819	57080	3.81
Pinoxaden + 2,4-D	4681	6785	56487	3.78
Pinoxaden fb Carfentrazone-ethyl	4622	6732	55370	3.69
Pinoxaden fb Metsulfuron-methyl	4287	6357	50353	3.46
Pinoxaden fb 2,4-D	4296	6359	50433	3.46
Carfentrazone-ethyl	3704	5662	41768	3.10
Idosulfuron + Mesosulfuron	4648	6748	55541	3.68
2,4-D	3394	5181	36680	2.86
Weed free	4927	7088	55997	3.26
Weedy check	2949	4630	30188	2.57
S.E. m (d) ± C.D. (at 5%)	88 174	162 321	- -	- -

References

1. Ashrafi ZY, Sadeghi S, Mashhadi HR. Study of integrate methods chemical and cultural control of weeds to wheat (*Triticum aestivum* L.) Journal of Agricultural Science (Tornto). 2009; 1(2):113-119.
2. Azad BS, Singh H, Gupta SC. Effect of plant density, dose of herbicide and time of nitrogen application on weed suppression and its efficiency in wheat (*Triticum aestivum* L.). *Env. Ecol.*, 1997; 15(3):665-668.
3. Bhan VM. Status of research on weed science and its impact. Present at seventeenth meeting of the Governing body of the ICAR, New Delhi, 1998.
4. Chopra NK, Chopra Nisha, Sinha SN. Influence of new broad leaf herbicides on weed control seed yield and quality of some wheat cultivars. Indian Journal of Agricultural Science. 2008a; 78(5):405-407
5. Das TK, Yaduraju NT. Effect of weed competition on growth, nutrient uptake and yield of wheat as affected by irrigation and fertilizers. Journal of Agric. Sci. 1999; 133(1):45-51.
6. Jat RS, Nepalia V, Chaudhary PD. Influence of herbicides and methods of sowing on weed dynamics in wheat. Indian Journal of Weed Science. 2003; 35(1-2):18-20.
7. Katara Pawan, Kumar Suresh, Rana SS, Chander Navell. Combination of pinoxaden with other herbicides against complex weed flora in wheat. Indian Journal of weed science. 2012; 44(4):225-230.
8. Khokhar AK, Nepalia V. Effect of herbicides and nutrient management on weed flora, nutrient uptake and yield of wheat (*Triticum aestivum*) under irrigated conditions. Indian Journal of Weed Science. 2010; 42(1-2):14-18.
9. Li FS, Kang SZ, Zang JH, Cohen S. Effect of atmospheric CO_2 enrichment, water status and applied nitrogen-use efficiencies of wheat. Plant soil. 2003; 254(2):279-289.
10. Meena RS, Singh MK. Weed management in late-sown zero-till wheat (*Triticum aestivum*) with varying seed rate. Indian Journal of Agronomy. 2011; 56(2):127-132.
11. Nadeem Muhammad Ather, Ali Asghar, Tanveer Asif. Effect of different weed control practices and fertilizer levels on the weed and grain yield of wheat. Pakistan Journal of Botany. 2006; 38(1):173-182.
12. Nariyal MC, Singh Rohitashav, Tripathi SSL, Mishra OP. Effect of pinoxaden 5 EC on weeds in wheat crop. *Biennial conference on Weed management in Modern Agriculyure. Emerging Challenges and Opportunities*, February 27-28, (2008). I.S.W.S., N.R.C.W.S. and R.A.U., Pusa (Bihar), Abstracts, 2007.
13. Nayak S, Rawat AK, Sharma RS. Effect of metsulfuron methyl and 2,4-D alone and in combination for control of broad leaf weeds in irrigated wheat. JNKVV Research Journal. 2003; 37(1):104-106.
14. Rehman Sadur, khalil Shad K, Muhammad Fida, Rehaman Abdur, Khan Amir Z, Amanullah Rehman *et al*. Phenology, leaf area index and grain yield of wheat influenced by organic and inorganic fertilizer. Pakistan Journal Botany. 2010; 42(5):3671-3685
15. Rathi AS, Kumar Vineet, Singh VP, Singh DK. Integrated weed management in irrigated wheat. Progressive Agriculture. 2008; 8(1):74-76.
16. Sharma Rajvir, Pahuja SS, Balyan RS, Malik RK. Effect of sulfonylurea herbicides applied alone and tank mix with metribuzin on weeds in wheat and their residual effect on succeeding crop of sorghum. Indian Journal of Weed Science. 2002; 34(3-4):178-183.
17. Yadav Dharma bir, Punia SS, Yadav Ashok, Singh Samunder, Lal Rashan. Pinoxaden an alternate herbicide against little seed canary grass (*Phalaris minor*) in wheat (*Triticum aestivum*). Indian Journal of agronomy. 2009a; 54(4):433-437.
18. Yadav DB, Punia SS, Yadav Ashok, Lal Roshan. Compatibility of sulfosulfuron with carfentrazone-ethyl for the control of complex weed flora in wheat. Indian Journal of Weed Science. 2009b; 41(3-4):146-149.