The Pharma Innovation Journal 2022; 11(7): 1285-1288

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(7): 1285-1288

www.thepharmajournal.com
Received: 12-04-2022
Accepted: 29-06-2022

Shweta Priya
M.Sc. Student, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Ram Niwas
Assistant Professor, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

AS Yadav
Assistant Professor, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Raghvendra Singh
Assistant Professor, Department of SC&WM, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Ajay Kumar
M.Sc. Student, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Corresponding Author:
Shweta Priya
M.Sc. Student, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Effect of integrated weed management practices on growth and yield of (*Triticum aestivum* L.) wheat under timely sown condition

Shweta Priya, Ram Niwas, AS Yadav, Raghvendra Singh and Ajay Kumar

Abstract
An agronomic investigation to study the response of integrated weed management (IWM) in wheat crop. Research was conducted during *Rabi* season of 2020-21 an agricultural Farm at Rama University, Kanpur 209217 (U.P) India. The experiment was laid out in RBD design with three replication and 10 different integrated weed management treatments. The results of the experiment showed that major weed flora identified in the fields were non grassy weeds (Krishnaneel, Senji, Bathua and Gajri etc.) which was dominated over grassy weeds and sedges with *Anagallis arvensis* being the most dominant weed. Weed free check (Two hand weeding 25 and 40 DAS) performed significantly superior to all the weed management practices. However, among weed control practices, treatment (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha) were recorded minimum weed density 8.20 m^{-2} and 7.36 m^{-2} at 60 DAS and 90DAS, respectively), weed dry weight (6.68 gm^{-2} and 5.21 gm^{-2} at 60 and 90 DAS), minimum weed index (2.96), maximum weed control efficiency, maximum dry matter accumulation per plant, maximum leaf area index, maximum length of the spike, maximum number of grains per spike (54.89), maximum grain weight (14.10 g per plant), maximum test weight (35.86 g), maximum grain yield (42.72 qha^{-1}), straw yield (67.71 qha^{-1}). Maximum biological yield (110.23 qha^{-1}), harvest index (38.76), was recorded under treatment T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha). Maximum B: C ratio of 3.25 was also achieved with the treatment comprising Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha.

Keywords: IWM, growth attribute, weed, wheat and yield

Introduction
Wheat (*Triticum aestivum* L.) is an annual plant from *Poaceae* family, it is most cultivated staple food crop of world and second only to rice. Wheat contributes nearly 25 per cent of total food grain production of country. The main cultivated species of wheat are common wheat (*Triticum aestivum* L.), Durum wheat (*Triticum durum* Desf.) and Emmer wheat (*Triticum dicoccum* Schrank). Among cereals, wheat is considered to be a rich source of protein, minerals and vitamins. Wheat is cheap source of amino acids, whole wheat grain contain significant amount of Fe, P, Mg, Mn, Cu, and Zn and also vitamin B. Most of the agricultural land in the world is devoted to wheat cultivation. In world USA, Russia, China, Australia, Germany, France, Argentina and India are the main wheat producing countries. Around the world, wheat is cultivated over an area 221.85 million hectare accounting for 776.10 million metric tonnes production and a productivity of 3.50 mt ha^{-1}. In India, wheat is cultivated over an area of 57326.54 thousand hectare with annual production of 135891.27 thousand tones (Anonymous, 2020) [1].

Wheat production can be increased by 3 ways i.e. firstly by increasing area of cultivation under the wheat crop, which is likely not expected to increase, secondly by increasing the yield of wheat through proper allocation and input management of resources and lastly by reducing the losses caused by various insect/pests and weeds. Weeds compete with the wheat plants for nutrients, moisture, space and light. Under the smothering effect when weeds emerge well before the emergence of the main wheat crop, the competition between weeds and wheat becomes more intense. Weed species, weed density, emergence time, soil condition and congenial environmental factors determine the extent of loss in production (Chandra *et al*, 2018) [3]. Under severe weed infestations, complete loss of crop may be observed (Choudhary *et al.* 2016) [4]. Integrated Weed Management (IWM) means integrating multiple weed control tactics into a single weed management program, optimizing control of a particular weed problem. Application of herbicide is the most common weed management approach. The reliance on this one approach has resulted in the evolution of herbicide-resistant weeds.

There are only a limited number of herbicides available for use, and herbicide resistance is on the rise in the United States. As a result, herbicides require additional assistance to maintain appropriate weed control. IWM strategies cover a wide range of alternatives and levels of sophistication. Many IWM strategies can be implemented without requiring significant changes to existing management systems, whilst others necessitate more intensive preparation and implementation. Equipment cleaning, timely scouting, and changing herbicide tank mixtures are some of the simpler solutions; more complex options include modifying crop rotation, cover cropping, changing tillage practices, and harvest time weed seed management. To control diverse weed flora, application of two or more herbicides is advantageous to control broad spectrum weed flora.

Material and Methods

The field experiment was conducted during *Rabi* season of 2020-2021 at Agricultural Research Farm, of Rama University, Mandhana, Kanpur Nagar (U.P.) which is situated in the alluvial tract of Indo - Gangatic Plain in central part of Uttar Pradesh between $25^0$26′ to $26^0$58' North latitude, $79^0$31′ to $31^0$34' East longitude and on the altitude of 125.9 meters. The irrigation facilities are adequately available on this farm. The farm is situated in the main campus of the university. During the cropping season maximum temperature ranges from 17 to 35.1 ^{0}C, while the lowest temperature ranges from 6 to 21.7 ^{0}C. During the cropping period, relative humidity ranged from 24 to 94 percent. During the trial, average wind speeds ranged from 1.3 to 6.3 km hr^{-1}. During the testing period, the trail location got a total of 43.2 mm of rain in one wet day, providing favourable conditions for crop development. The experiment was laid out in Randomized Block Deign with three replications and 10 weed control practices *viz.* T_1- Pendimethalin 30EC @ 1 kg a.i. ha^{-1}, T_2- Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ one hand weeding, T_3- Metribuzin @ 200 g a.i. ha^{-1}, T_4- Metribuzin @ 200 g a.i. ha^{-1}+ one hand weeding, T_5- Clodinafop @ 60 g a. i. ha^{-1}, T_6- Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha, T_7- Metribuzin @ 200 g a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha, T_8- Sulfosulfuron-ethyl + MSE @ 33 g a. i. ha, T_9- Weedy free check (Two hand weeding 25 and 40 DAS) and T_{10}- Weed check. All plots of experiment was equally fertilized with recommended dose of fertilizers (150:60:40 kg ha^{-1} NPK). The source of nitrogen, phosphorus and potassium were urea, di-ammonium phosphate and murate of potash respectively. The soil of the experimental site was clay loamy in texture, low in organic carbon (0.40%), available nitrogen (166.53 kg ha^{-1}) and medium in available phosphorus (18.73 kg ha^{-1}) and potash (266.27 kg ha^{-1}) with slightly alkaline in reaction (8.2 pH). Wheat was sown in line at 20 cm row to row distance and seed rate 120.0 kg ha^{-1} was used for sowing of experimental crop and before sowing seed was treated with vitavax @ 2.5 g kg^{-1} of seed. Experimental crop was herbicide use as per treatments.

Results and Discussion

Effect of Weed management practices on weed studies of wheat crop: The results obtained during the study reveal that non grassy weeds (Krishnaneel, Senji, Bathua and Gajri etc.) dominated over grassy weeds and sedges. *Anagallis arvensis* was the most dominant weed followed by *Melilotus spp.* and *Chenopolium album*.

At 60 and 90 days following crop sowing, maximum total weed density (m^{-2}) was observed under weedy check where weed density was recorded as 18.48 m^{-2} and 16.72 m^{-2}, respectively whereas lowest weed density among herbicidal treatment was observed in T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha) where minimum weed density of 8.20 m^{-2} and 7.36 m^{-2} was recorded at 60 DAS and 90 DAS (Table 1). Less weed density in the plots treated with Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha was due to the efficicacy of sulfosulfuron in eradicating the weeds in the intitial days of weed growth. For commercial production of wheat, eradication of weeds is a most important requirement as suggested by Saha *et al.*, (2016). Sharma (2003) [8, 10]. The dry weight of total weeds grew with the number of days after sowing up to 90 days after sowing (Table 1). Perusal of table clearly demonstrates that application of sulfosulfuron ethyl + MSE @35 g a.i. ha^{-1}, which resulted in lowest dry weight of total weeds at all the stages as compared to other forms of weed control techniques performed during the experiment recording 3.78 g/m^{-2}, 6.68 gm^{-2} and 5.21 gm^{-2} at 30 DAS, 60 DAS and 90 DAS, respectively. Similar findings have been reported by Kumar *et al.* (2006) [6]. Maximum weed index among all the weed control treatments (5.14) was recorded under T_{10} (weed check) followed by treatment T_1 (Pendimethalin 30EC @ 1 kg a.i. ha^{-1}) where weed index of 4.62 was computed. Minimum weed index of 1.83 was recorded under T_9. Among weedicide treatments, minimum weed index (2.96) was computed under the treatment T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha^{-1}). At 30 DAS, maximum weed control efficiency (10.12%) was achieved under treatment T_9 (Weedy free check (Two hand weeding 25 and 40 DAS) followed by treatment. However, minimum weed control efficiency was recorded under treatment T_{10} where weed control efficiency of 1.88 per cent was recorded. It might be due to all weed control treatment were effective in controlling weeds at harvest as compared to the weedy control (Nayak *et al.* 2003) [7].

Effect of weed management practices on growth attributes of wheat: Maximum dry matter accumulation per plant on wheat was recorded under the treatment T_9 (Weedy free check (Two hand weeding 25 and 40 DAS) which was observed 23.28 g. Among the weedicidal treatments, However, minimum dry matter accumulation was recorded under the treatment T_{10} (weedy check) where a dry matter accumulation of 12.64 g was recorded (Table 2). All the weed control treatments were found to have superior dry matter accumulation in wheat as compared to weed check treatment. It might be due to use of herbicides led to reduced weed density and dry matter production in weeds as compared to other check treatments Bhardwaj *et al.* (2004) [2]. Leaf area index in wheat under different weed management treatments was recorded maximum (5.89) under treatment T_9 (Weedy free check (Two hand weeding 25 and 40 DAS).

Effect of weed management practices on yield and yield attributes: Among various herbicidal treatments, maximum spike length (8.47 cm), number of grains per spike (54.89), grain weight per plant (14.10 g) and test weight (35.86 g) was recorded under treatment T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha). Application of weedicides indirectly helps in improving the growth and yield characters as reported bv Wani *et al.* (2005) [12], Singh *et al.* (2013) [11]. Maximum grain yield (45.61 qha^{-1}) was recorded under the integrated weed management practice of weed free check T_9 (Two hand weeding 25 and 40 DAS) over rest of the treatments (Table 3). However, it was at par with the treatment T_8 (Sulfosulfuron-ethyl + MSE @ 33 g a. i. ha) where grain yield was recorded 42.72 qha^{-1}. Among hernicidal treatments, significantly maximum straw yield was recorded under T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha) where straw yield was recorded 67.71 qha^{-1}. This treatments also recorded maximum biological yield of 110.23 qha^{-1}. Treatment T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha) recording a harvest index of 38.76. Minimum harvest index of 34.98 per cent was recorded under the treatment T_{10} (Weed check).

Effect of weed management practices on economics

Maximum cost of cultivation was incurred in the treatment T_9 (Weedy free check (Two hand weeding 25 and 40 DAS) where cost of cultivation was recorded as Rs. 34800/- per hectare. Maximum gross income (returns) were achieved under the treatment T_9 (Weedy free check (Two hand weeding 25 and 40 DAS) where gross return of Rs. 143498.25 were obtained (Table 3). Treatment T_9 (Weedy free check (Two hand weeding 25 and 40 DAS) recorded maximum returns/net income among all the treatments registering a net income of Rs. 108698.25 which was in close proximity with treatment T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha) having a net income of Rs. 105829.00. Benefit cost ratio (3.25) was observed highest under the treatment T_8 (Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha). Similar findings also reported by Singh *et al.* (2013) [11], Zehan *et al.* (2021) and Kaur *et al.* (2017) [5].

Table 1: Effect of various weed control treatments on weed studies of wheat crop

Treatments	Total weed density (m^{-2})			Dry weight of total weeds (g m^{-2})			Weed control efficiency		Weed Index (%)
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	
T_1 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}	18.06	9.82	8.92	3.84	7.11	5.55	5.50	5.34	4.62
T_2 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ one hand weeding	17.72	9.20	8.33	3.83	6.91	5.43	5.94	5.81	4.31
T_3 = Metribuzin @ 200 g a.i. ha^{-1}	17.34	9.36	8.58	3.84	6.87	5.48	5.82	5.89	4.42
T_4 = Metribuzin @ 200 g a.i. ha^{-1}+ one hand weeding	17.38	8.92	8.97	3.84	7.16	5.63	5.45	5.30	4.58
T_5 = Clodinafop @ 60 g a. i. ha^{-1}	18.26	9.94	8.08	3.82	6.86	5.37	6.09	5.91	4.12
T_6 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha	18.42	8.56	7.75	3.78	6.71	5.33	6.19	6.17	3.32
T_7 = Metribuzin @ 200 g a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha	18.50	8.78	7.97	3.83	6.80	5.35	6.14	6.01	3.89
T_8 = Sulfosulfuron-ethyl + MSE @ 33 g a. i. ha	17.96	8.20	7.36	3.78	6.68	5.21	6.47	6.23	2.96
T_9 = Weedy free check (Two hand weeding 25 and 40 DAS)	0.00	3.28	5.86	1.95	3.62	4.26	10.12	10.16	1.83
T_{10} = Weed check	18.48	16.72	15.05	3.86	8.17	6.52	1.88	1.88	5.14
S.Em (±)	0.27	0.23	0.26	0.08	0.13	0. 15	0.13	0. 12	0.19
C.D. (p=0.05)	0.81	0.68	0.71	0. 21	0.36	0.40	0.36	0.34	0.59

Table 2: Effect of various treatments on growth attribute of wheat crop.

Treatment	Dry matter accumulation (g)	Leaf Area Index	Length of spike (cm)	Number of grains per spike	Grain weight per plant (g)	Test weight (g)
T_1 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}	19.47	5.39	8.14	44.89	13.09	34.21
T_2 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ one hand weeding	17.81	4.89	8.21	50.18	13.56	35.21
T_3 = Metribuzin @ 200 g a.i. ha^{-1}	20.82	5.51	8.31	53.54	13.74	35.58
T_4 = Metribuzin @ 200 g a.i. ha^{-1}+ one hand weeding	21.86	5.59	8.36	53.74	13.85	35.58
T_5 = Clodinafop @ 60 g a. i. ha^{-1}	17.21	4.76	8.06	49.76	12.85	33.64
T_6 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha	19.75	5.28	8.20	52.02	13.32	34.85
T_7 = Metribuzin @ 200 g a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha	20.24	5.12	8.19	51.97	13.19	34.51
T_8 = Sulfosulfuron-ethyl + MSE @ 33 g a. i. ha	22.46	5.62	8.47	54.89	14.10	35.86
T_9 = Weedy free check (Two hand weeding 25 and 40 DAS)	23.28	5.89	8.49	55.14	14.18	36.28
T_{10} = Weed check	12.64	3.21	7.34	42.26	8.45	30.54
S.Em (±)	0.13	0.19	1.21	1.36	0.29	1.68
C.D. (p=0.05)	0.36	0.59	NS	4.18	0.86	NS

Table 3: Effect of various treatments on yield and economics of wheat crop

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Biological yield (q ha^{-1})	Harvest index (%)	Cost of cultivation ($Rs.ha^{-1}$)	Gross return ($Rs.ha^{-1}$)	Net return ($Rs.ha^{-1}$)	B: C ratio
T_1 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}	36.1	65.86	103.06	35.03	32158	122180.5	90022.5	2.80
T_2 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ one hand weeding	37.01	65.46	103.57	35.73	34547	123612.25	89065.25	2.58
T_3 = Metribuzin @ 200 g a.i. ha^{-1}	36.86	67.23	105.19	35.04	33618	124739.50	91121.5	2.70
T_4 = Metribuzin @ 200 g a.i. ha^{-1}+ one hand weeding	36.21	66.06	103.38	35.03	34525	122552.25	88027.25	2.55
T_5 = Clodinafop @ 60 g a. i. ha^{-1}	37.78	66.8	105.67	35.75	32350	126166.50	93816.5	2.90
T_6 = Pendimethalin 30EC @ 1 kg a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha	40.08	66.73	108	37.11	34200	130538.00	95738	2.81
T_7 = Metribuzin @ 200 g a.i. ha^{-1}+ 2-4 DEE @ 0.500 kg a.i. ha	38.84	66.64	106.58	36.44	33450	128079.00	92629	2.82
T_8 = Sulfosulfuron-ethyl + MSE @ 33 g a. i. ha	42.72	67.71	110.23	38.76	32500	138329.00	105829	3.25
T_9 = Weedy free check (Two hand weeding 25 and 40 DAS)	45.61	72.03	116.64	39.10	34800	143498.25	108698.25	3.12

T_{10} = Weed check	33.64	58.47	96.17	34.98	28100	111533.00	83433	2.97
S.Em (±)	1.17	1.47	3.41	0.58	-	-	-	-
C.D. (p=0.05)	3.42	4.21	9.40	1.67	-	-	-	-

Conclusion
From the present study, it can be concluded that although weed free check is the most efficient method for controlling the weeds in wheat field, but among the herbicidal treatments followed to control the weeds, application of Sulfosulfuron-ethyl + MSE @ 35 g a. i. ha was found to be the best among all the treatments as the wheat plants not only recorded reduced weed incidence and characteristics, but the wheat crop also showed improved yield contributing characters, yield characters and economics of cultivation.

Acknowledgements
All the support meted out during the conduct of this experiment from my advisor, officials of the Department of Agronomy, Rama University, Kanpur as well the field staff, friends is highly acknowledged.

References
1. Anonymous. ICAR wheat database 2020. https://eands.dacnet.nic.in/APY_96_To_06.htm
2. Bhardwaj AK, Singh RK, Singh SP, Singh Y, Singh G, Mishra RD. Weed management in zero-till sown wheat. Indian J Weed Sci. 2004;36(3-4):175-177.
3. Chandra S, Kumar S, Acharya S, Kumar P, Tyagi S. Effect of different weed management practices on growth and yield of wheat and associated weeds. Int. J Curr. Microbiol. Appl. Sci. 2018;**7:**3859-3865.
4. Choudhary D, Singh PK, Chopra NK, Rana SC. Effect of herbicides and herbicide mixtures on weeds in wheat. Indian Journal of Agricultural Research. 2016;50(2):107-112.
5. Kaur S, Kaur T, Bhullar MS. Control of mixed weed flora in wheat with sequential application of pre-and post-emergence herbicides. Indian Journal of Weed Science. 2017;49(1):29-32.
6. Kumar M, Singh D, Tomar PK. Effect of sowing dates and weed control method on productivity of wheat (*Triticum aestivm* L.) in Uttaranchal. Ann. Agric. Res. New Series. 2006;27(2):195-197.
7. 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. JNKW Research J. 2003;37(1):104-106.
8. Saha S, Yaduraju MT, Kulshrestha G. Residue studies and efficacy of sulfosulfuron in wheat crop. Pest. Res. J. 2016;15(2):173- 175.
9. Sahu R, Sharda K, Kumar D, Mandal SK. Weed population, weed biomass and grain yield of wheat as influenced by herbicides application. 2018.
10. Sharma R. Effect of low dose of sulfonylurea herbicides on weeds and yield of wheat. Annals of Agricultural research. 2003;24(1):217-219.
11. Singh RK, Verma SK, Singh RP. Bio-efficacy of carfentrazone-ethyl+ sulfosulfuron in wheat. Indian Society of Weed Science. 2013;25(2):45-51.
12. Wani Smeia, Lone BA, Ansar-ul-Haq S, Bahari FA, Sofi KA, Sofi NA. Weed management in late sown wheat using different herbicide. Environment and Ecology. 2005;3:546-548.
13. Zahan T, Hossain MF, Chowdhury AK, Ali MO, Ali MA, Dessoky ES. Herbicide in Weed Management of Wheat (*Triticum aestivum* L.) and Rainy Season Rice (*Oryza sativa* L.) under Conservation Agricultural System. Agronomy. 2021;11:1704.