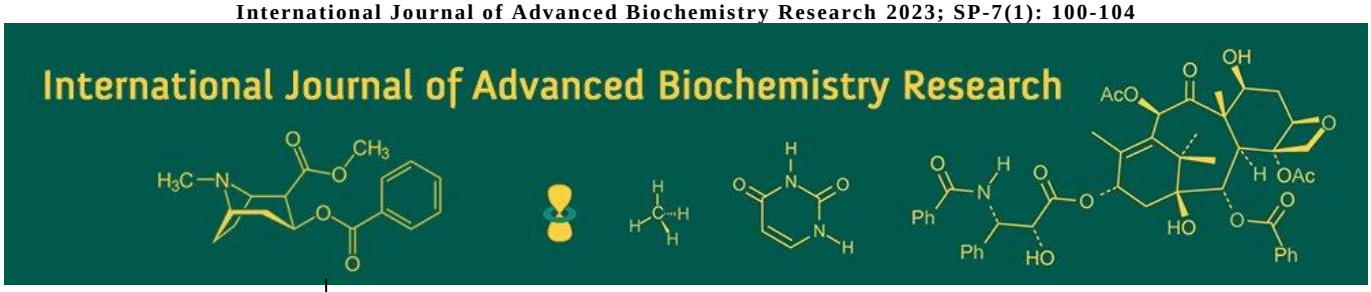

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2023; SP-7(1): 100-104
www.biochemjournal.com
Received: 22-04-2023
Accepted: 27-05-2023

Rajnish
Dev Bhoomi Uttarakhand University, Naugaon, Uttarakhand, India

Manisha Phaugat
Dev Bhoomi Uttarakhand University, Naugaon, Uttarakhand, India

Minnu Sasi
Dev Bhoomi Uttarakhand University, Naugaon, Uttarakhand, India

Tapor Pakpu
Dev Bhoomi Uttarakhand University, Naugaon, Uttarakhand, India

Prerna Gupta
Dev Bhoomi Uttarakhand University, Naugaon, Uttarakhand, India

Priya Rawat
Dev Bhoomi Uttarakhand University, Naugaon, Uttarakhand, India

Corresponding Author:
Rajnish
Dev Bhoomi Uttarakhand University, Naugaon, Uttarakhand, India

Effect of weed management practices on weeds and productivity of timely sown wheat (*Triticum aestivum* L.)

Rajnish, Manisha Phaugat, Minnu Sasi, Tapor Pakpu, Prerna Gupta and Priya Rawat

DOI: https://doi.org/10.33545/26174693.2023.v7.i2Sb.195

Abstract
Wheat, a significant grain crop, is the second-largest crop in terms of acreage and output after rice. It is farmed on around 217 million hectares worldwide, with nearly half of it in poor nations. Wheat is a member of the Poaceae family. Weed flora in wheat crop includes *Phalaris minor, Avena ludoviciana, Chenopodium album, Lathyrus aphaca, Vicia sativa, Vicia hirsute, Medicago hispida, Cichorium intybus, Asphodelus tenuifolius, and Melilotus alba.* The major weed flora dominated with grassy weeds comprising Phalaris minor (29.7%) and *Avena ludoviciana* (40%), while the broad leaf weeds were *Lathyrus, aphaca* (8.8%), *Chenopodium album* (8.2%), *Melilotus indica* (4%), *Rumex retroflexus* (4%), *Coronopus didymus* (2.7%), and *Convolvulus arvensis* (2.5%). The major weed flora of wheat crop includes *Polygonum orientale, P. minor, Eclipta alba, Cynodon dactylon, Setaria glauca, Digitaria sanguinalis, Shyamet al*., Weed control efficiency of metsulfuron methyl treated plots was also maximum at 4 g ha-1 (81.3%) and at 6 g ha-1 (91.3%). Soil characteristics were determined by collecting soil samples from 10 locations in the experimental field. The results of mechanical and chemical analysis showed that weed management practices significantly affected plant height at all stages of crop growth except 30 days after transplanting. The maximum plant height was recorded in weed free treatment, which was at par with Clodinafop + Metsulfuron, Carfentazone, Clodinafop + Metsulfuron, Carfentazone + Sulfosulfuron, and Clodinofop + Carfentazone. Yield attributes were also analyzed, with the number of spikes and length of spike recorded significantly higher in weed free treatment. The maximum length of spike (11.2) was recorded under weed free treatment, which was significantly higher than Metsulfuron, Clodinafop, Carfentazone, and weed check.

Keywords: Weed management, wheat, crop, grain

1. Introduction
Wheat (*Triticum aestivum* L.) is the most significant grain crop in terms of both its antiquity and its usage as a human food source. Wheat is a reliable food source for over one billion people in 43 nations across the world. It supplies around 20% of a human's total calorie intake. Wheat is farmed on around 217 million hectares (ha) throughout the world, with nearly half of it in poor nations. The primary wheat-growing regions are country including, China, India, U.S.A., Russia, France, Canada, German, Turkey, Australia, and Ukraine. Today, it is one among India's grain crops. Wheat is the second-largest crop in terms of acreage and output after rice. Wheat is a member of the Poaceae family and is thought to have originated in Asia's Middle East. Wheat is the world's most productive crop in terms of area (217.02 m.ha.) and output (764.50 million metric tonnes), with a productivity of 3.52 metric ton. ha^{-1} (FAS/USDA 2019- 20). During the 2018-19 rabi season, India produced 99.87 million metric tonnes of wheat from a covered area of 29.65 million hectares, with a productivity of 3.37 metric ton. ha^{-1}. In India, U.P. ranks first in respect of area (9.54 M ha) and production (32.74 mt), however, the productivity is comparatively low as compared to Panjabi and Haryana states. The major reason for Lower productivity are continuous adoption of cereal- cereal (rice-wheat) cropping system, untimely and imbalanced fertilization, delayed sowing and poor weed management etc.

2. Materials and Methods

2.1 Soil Characteristics

In order to determine the physio-chemical characteristics of the soil and fertility status, the soil samples were collected random from10 places of the experimental field with the help of soil auger to a depth at 0-15 cm. The collected soil samples were mixed together and a composite sample was drawn and analyzed in laboratory for physio-chemical properties. The results of mechanical and chemical analysis have been given in the Table 1.

Table 1: Physico-chemical properties of experimental field Mechanical composition of the soil of the experimental field

S.N.	Particulars	Values (%)	Method employed
1.	Sand	27.53%	Hydrometer method
2.	Silt	54.50%	
3.	Clay	18.45%	
4.	Texture class	Silty loam	Triangular method (Lyon *et al*., 1952) [20]

Detail of treatments with their symbols

Symbol	Treatment
T_1	Metsulfuron @ 4 g a. i. ha^{-1} t
T_2	Clodinafop @ 60 g a. i. ha^{-1}
T_3	Carfentazone @ 20 g a. i. ha^{-1}
T_4	Carfentazone + Sulfosulfuron @ 20 g a.i. + 25 g a.i. ha^{-1}
T_5	Sulfosulfuron @ 25 a.i. g ha^{-1}
T_6	Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-}
T_7	Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1}
T_8	Clodinofop + Carfentazone @ (60 g a.i. + 20 g a.i.) ha^{-1}
T_9	Weed free
T_{10}	Weedy check

Result and Discussion

Plant height (cm)

Data pertaining to plant height given in table clearly indicated that the plant height increased with advancement of the age and the rate of increase was more pronounced between at 30 to 90 DAS. Data related to plant height given in Tableg indicate that weed management practices affect plant height significantly at all stages of crop growth except 30 DAS. Data further revealed that the maximum plant height was recorded in weed free treatment being at par with Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1}, Sulfosulfuron + Metsulfuron @ (30 +2) 32 g ha^{-1}, Carfentazone + Sulfosulfuron @ 20 g a.i.+25 g a. i. ha^{-1} and Clodinofop + Carfentazone @ (60 g a. i. + 20 g a. i.) ha^{-1} which significantly higher than rest of the weed management practices at 60, 90 DAS and at harvest.

Treatments	Days after transplanting			
	Plant Height	Number of tillers	Dry matter	Leaf area index
1. Metsulfuron @ 4 g a.i. ha^{-1}	79.9	273.2	1012.6	4.36
2. Clodinafop @60 g a.i. ha^{-1}	82.2	284.1	1051.5	4.45
3. Carfentazone @20 g a.i. ha^{-1}	77.7	261.2	977.2	4.22
4. Carfentazone + Sulfosulfuron @ 20 g a.i. + 25 g a.i. ha^{-1}	88.3	315.7	1208.5	4.75
5. Sulfosulfuron @ 25 a.i. g ha^{-1}	85.8	306.3	1115	4.62
6. Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1}	91.8	352.4	1263	4.91
7. Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1}	89.6	344.8	1249.5	4.86
8. Clodinofop + Carfentazone @ (60 g a.i. + 20 g a.i.) ha^{-1}	86.4	316.5	1166.5	4.70
9. Weed free	92.5	358.2	1340.0	5.02
10. Weedy check	71.8	243.4	875.0	3.75
SEm±	2.71	14.10	38.76	0.19
CD at 5%	8.05	41.90	115.15	0.57

Yield attributes No of spike (m^{-2})

Yield attributes is the resultant of the vegetative and reproductive development of the plants. The results with respect to number of spikes m^{-2} are presented in Table- reveals that all weed management practices, produced significantly higher no. of spike over weedy check. The higher number of Spikes m^{-2} recorded with weed free treatment which were at par with Carfentazone + Sulfosulfuron @ 20 g a.i. + 25 g a.i. ha^{-1}, Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1}, Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1} and Clodinofop + Carfentazone @ (60 g a.i. + 20 g a.i.) ha^{-1}. While significantly higher than rest of the weed management practices. Among herbicide Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1} produced maximum number of Spikes m^{-2}. The might be due to better availability of nutrient, moisture, space and Hight under effective weed control treatments which resulted better no. of spike m^{-2}, similar results also reported by Singh 2011 [21].

Length of spike (cm)

The data pertaining to length of spike of wheat are presented in Table. Clearly revealed that weed management practices had significant effect on length of spike. Maximum length of spike (11.2) was recorded under weed free which was significantly higher than Metsulfuron @ 4 g a.i. ha^{-1},

Clodinafop @60 g a.i. ha^{-1}, Carfentazone @20 g a.i. ha^{-1} and weed check while at par with rest of the weed management practices.

No. of spikelets spike^{-1}

The results with respect to No. of spikelets spike^{-1} are presented in Table and depicted in Fig-4.15 reveals that all weed management practices, produced non-significant.

No. of grain spike^{-1}

The results with respect to No. of grain spike^{-1} are presented in Table reveals that all weed management practice had produced non- significant effect on no. of spikelets $^{-1}$, however, maximum recorded under weed free situation.

Test weight

The results with respect to test weight are presented in Table reveals that weed management practices, did not influenced test weight significantly. However, maximum test weight recorded under weed free situation.

Table 2: Effect of various weed management practices on yield attributes of wheat

Treatments	Number of spike (m^{-2})	Length of spike (cm)	Number of pikelets spike-1	Number of grain spike-1	Test weight (g)
1. Metsulfuron @ 4 g a.i. ha^{-1}	248.0	9.93	18.2	43.8	40.87
2. Clodinafop @60 g a.i. ha^{-1}	258.0	9.95	18.3	44.0	40.9
3. Carfentazone @20 g a.i. ha^{-1}	237.0	9.8	17.6	44.0	40.8
4. Carfentazone + Sulfosulfuron @ 20 ga.i. + 25 g a.i. ha^{-1}	300.0	10.8	19.4	44.0	41.1
50 Sulfosulfuron @ 25 a.i. g ha^{-1}	278.0	10.45	18.8	43.8	40.95
6. Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1}	318.0	11.1	20.0	44.4	41.46
7. Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1}	313.0	10.9	19.6	44.5	41.3
8. Clodinofop + arfentazone @ (60 g a.i. + 20 g a.i.) ha^{-1}	293.0	10.75	19.3	44.0	41.0
9. Weed free	325.0	11.2	20.2	45.0	41.5
10. Weedy check	221.0	9.5	17.1	42.8	39.8
SEm±	14.42	0.33	0.89	1.71	0.935
CD at 5%	42.85	0.99	NS	NS	NS

Yield studies

Biological yield

Data pertaining to biological yield are presented in Table-4.17 and depicted in Fig-4.16. All weed management practices resulted a significant increase in wheat biological yield over weedy check. The highest biological yield recorded with weed free (134 qha^{-1}) was at par with Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1}, Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1}and Carfentazone + Sulfosulfuron @ 20 g a.i. + 25 g a.i. ha^{-1} while significant superior to rest of the weed management treatment.

This might be due to effective weed control by these treatments such as to enhancement more *viz*. number of effective tillers, grain spike^{-1}, length of spike and test weight. Any factor affecting these parameters ultimately effect the biological and economical yield of crop. Source component may be number of leaves, number of tillers and dry matter accumulation of the plant before anthesis and sink component *viz*., number os spikelets spike^{-1}, number of spike m^{-2}, length of spike and test weight. Growth and development resulted more biological yield. Similar finding reported by Malik *et al*. (2013) [22].

Grain yield

The yield of a crop depends upon the source and sionk relationship and it's the cumulative function of various growth parameters and yield attributes. The data pertaining to the grain yield presented in Table-4.17 and depicted in Fig-4.16 indicate that weed management properties had significant effect grain yield. All weed management practices with resulted in a significant increase in wheat grain yield over weedy check. The highest grain yield 55.20 q ha^{-1} recorded weed free treatment which was statistically at par to Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1} and Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1}, while significantly superior to rest of the weed management practices.

It might be due to the smothering effect of the respective weed management practices. Which resulted in more translocation of food from source to sink responsibly more yield. Almost similar finding reported by Malik *et al*. (2013) [22].

Result and discussion

Straw yield (qha^{-1})

Data pertaining to the straw yield as influenced by seed rate and weed management practices are presented in Table-4.17 and depicted in Fig-4.16. Indicated that all weed management practices produce significantly higher straw yield over weedy check. The highest straw yield (78.8 ha^{-1}) recorded with weed free treatment which was at par with, Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1} and Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1}. While significantly higher than rest of the weed management practices.

The above findings may be due to effective control of weeds which contributed to better growth parameters and yield attributes, better vegetative growth coupled with higher yield attributes resulted in higher straw yield over rest of the weed management practices almost similar finding reported by Malik *et al.* (2013) [22].

Harvest index

The data pertaining to harvest index are presented in Table. The effect of different weed management practices on harvest index was non- significant. However, Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1} resulted maximum harvest index comparable to weed free.

Table 3: Effect of various weed management practices on yield studies of wheat

Treatments	Biological Yield (q ha^{-1})	Grain Yield (q ha^{-1})	Straw Yield (q ha^{-1})	Harvest Index (%)
1. Metsulfuron @ 4 g a.i. ha^{-1}	101.26	40.1	61.16	39.60
2. Clodinafop @60 g a.i. ha^{-1}	105.15	41.7	63.45	39.65
3. Carfentazone @20 g a.i. ha^{-1}	97.72	38.5	59.22	39.39
4. Carfentazone + Sulfosulfuron @ 20 g a.i. + 25 g a.i. ha^{-1}	120.85	49.95	72.15	40.29
5. Sulfosulfuron @ 25 a.i. g ha^{-1}	111.5	44.6	66.9	40.00
6. Clodinafop + Metsulfuron @ (60+4) 64 g ha^{-1}	126.3	52.90	74.4	41.09
7. Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha-1	124.95	52.30	73.65	41.05
8. Clodinofop + Carfentazone @ (60 g a.i. + 20 ga.i.) ha^{-1}	116.65	46.9	69.75	40.20
9. Weed free	134.0	55.2	78.8	41.19
10. Weedy check	87.5	34.3	53.2	39.2
SEm±	5.57	1.01	2.36	1.89
CD at 5%	16.54	3.02	7.02	NS

Summary and Conclusion

Weed density of *Phalaris minor* was found significant at all the stages of crop growth. Minimum weed density of *Phaleris minor* was found in weed free treatment, while Clodinafop + Metsulfuron @ (60+4) 64 g a.i. ha^{-1} reduced weed density effectively which was equal to Sulfosulfuron + Metsulfuron @ (30+2) 32 g a.i. ha^{-1} was comparable with weed free. Weed density of *Anagallis arvensis* was found significant at all the stages of crop growth. Minimum weed density of *Anagallis arvensis* was found in weed free treatment and after the application of herbicide Clodinofop + Metsulfuron @ (60 + 4) 64 g ha^{-1} reduced weed density comparable to weed free. Weed density of *Avena fatua* was found significant at all the stages of crop growth. Minimum weed density of *Avena fatua* was found in weed free treatment. After application of herbicides Clodinofop + Metsulfuron @ (60 + 4) 64 g ha^{-1} was found more effective to reduce the density of *Avena fatua* was comparable to weed free. Weed density of *Chenopodium album* was found significant at all the stages of crop growth. Minimum weed density of *Chenopodium album* was found in weed free treatment and after the application of herbicide Clodinofop + Metsulfuron @ (60+4) 64 g ha^{-1} reduced weed density effectively was comparable to weed free.

Weed density of other weed was found significant at all the stages of crop growth. Minimum weed density of other weeds was found in weed free treatment. Herbicide Clodinofop+ Metsulfuron @ (60+4) 64 g ha^{-1} was found more effective to reduce the density of other weed population which was comparable to weed free. Total weed density was found significant and minimum total density of weeds was found in weed free treatment. Among herbicide Clodinofop + Metsulfuron @ (60+4) 64 g ha^{-1} was found more effective to reduce weed density followed by Sulfosulfuron + Metsulfuron @ (30+2) 32 g ha^{-1} both was comparable to weed free.

Credit authorship contribution statement

Rajnish, Manisha Phaugat, Minnu Sasi: Conceptualisation; Methodology; Data curation; Writing- original draft. Tapor Pakpu, Prerna Gupta: Review & editing; Validation; Supervision.

Declaration of Competing Interest

The authors declare no conflict of interest.

Funding

"The authors declare that no funds, grants, or other support were received during the preparation of this manuscript."

Acknowledgement

The authors acknowledge the technical support received from the School of Agriculture, Dev Bhoomi Uttarakhand University, Naugaon, Dehradun, India.

References

1. Ali M, Sabir S, Kumar M, Ali MA. Efficacy and economics of different herbicides against narrow leaved weeds in wheat. International Journal of Agriculture & Biology. 2006;4:647-651.
2. Ali QM, Samiullah A, Ali A. Hand weeding Vs. Chemical weed control in wheat. Balochistan Journal of Agricultural Science. 2003;4(2):39-42.
3. Balyan RS. Evolution of New herbicides against mixed weed flora in wheat, Indian Journal of weed Science. 2001;33(3 and4):104-106.
4. Banga RS, Malik RK, Yadav A, Malik RS. Compatibility of Clodinafop with Metsulfuron and 2, 4-D against wild oat in wheat. In: Pro. Biennial Conf., Indian Society of weed Science; c2003. p. 17.
5. Barui K, Khuntia A, Ghosh SK, Ghosh P, Mondal D. Bio-efficacy of some new herbicide for eco-safe weed management in wheat (*Triticum aestivum* L.). J Crop Weed sci. 2006;2:9-12.
6. Bharat R, Kachroo D. Bio-efficacy of various herbicides and their mixtures on weeds and yield of wheat (*Triticum aestivum*) under subtropical agro-ecosystem. India J Agron. 2007;52(1):53-59.
7. Bharat R, Kachroo D, Sharma R, Gupta M, Sharma AK. Effect of different herbicides on weed growth and yield performance of wheat. Indian Journal of weed science. 2012;44(2):106-109.
8. Bhullar MS, Shergill LS, Kaur R, Walia US, Kaur T. Bio-efficacy of herbicides in relation to sowing methods in wheat, Indian Journal of weed science. 2012;44(4):214-217.
9. Bibi S, Bahadar K, Hassan G, Khan A. Integrated weed management through herbicides and different seed rates in wheat. Pakistan J Sci. 2005;11(3-4):121-129.
10. Bibi S, Khan BM, Gul H, Khan NM. Effect of herbicides and wheat population on control of weeds in wheat. Pakistan Journal of Weed Science Research. 2008;14(3&4):111-119.
11. Brar A Singh, Walia US. Effect of rice residue management techniques and herbicides on nutrient uptake by Phalaris minor Retz and wheat (*Triticum aestivum* L.) Indian Journal of Weed Science. 2008;40(3&4):121-127.

12. Brar AS, Walia US. Effect of rice residue management techniques and herbicides on nutrient uptake by Phalaris minor and wheat. Ind. J Weed Sci. 2008;40:121-127.
13. Brar AS, Walia US. Rice residue position and load in conjunction with weed control treatments interference with growth and development of Phalaris minor and wheat against broad leaf weeds in wheat. Journal of Crop and Weed. 2010;11:161-166.
14. Brar LS, Singh Manpreet, Walia US. Studies on the bioefficacy of triasulfuron and carfentrazone-ethyl for the control of broadleaf weeds in wheat. In: Proceeding National Biennial Conference Organization, by ISWS at PAU, Ludhiana during April 6-9; c2005. p. 36-37.
15. Chandra S, Kumar S, Acharya S, Kumar P, Tyagi S. Effect of Different Weed Management Practices on Growth and Yieldof Wheat and Associated Weeds International Journal of Current Microbiology and Applied Sciences. 2018;7:3859-3865.
16. Chhipa KG, Pareek RG, Jain NK. Evaluation of metsulfuron-methyl and sulfosulfuron alone and in combination with other herbicides against weeds in wheat. Haryana J Agron. 2005;21(1):72-73.
17. Chhokar RS, Malik RK. Isoproturon resistant little seed canary grass (Phalaris minor) and its response to alternate herbicides. Weed Technology. 2002;16:116-123.
18. Chhokar RS, Singh S, Sharma RK, Singh M. Influence of straw management on Phalaris minor control. Ind. J. Weed Sci. 2009;41:150-156.
19. Chitband AA, Ghorbani R, Mohassel MHR, Fizabadi AZ, Abbaspoor M. Jointed effects of mesosulfuron-methyl+ iodosulfuron-methyl-sodium and clodinafop-2013.
20. Lyon TL, Buckman HO. The nature and properties of soils. LWW; c1952 Oct 1.
21. Singh V, Joung D, Zhai L, Das S, Khondaker SI, Seal S. Graphene based materials: past, present and future. Progress in materials science. 2011 Oct 1;56(8):1178-271.
22. Malik VS, Pan A, Willett WC, Hu FB. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. The American journal of clinical nutrition. 2013 Oct 1;98(4):1084-102.