The Pharma Innovation Journal 2022; 11(11): 2583-2585

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 2583-2585

www.thepharmajournal.com
Received: 01-09-2022
Accepted: 07-10-2022

RN Jamdade
M.Sc. Student, Department of Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

SN Potkile
Agronomist, Experiment on Cultivators Field Scheme, Katol, Nagpur, Maharashtra, India

BK Atkari
M.Sc. Student, Department of Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

AJ Yelane
M.Sc. Student, Department of Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

ED Bagde
Assistant Professor, Plant Pathology, Reginal Fruit Research Station, Katol, Nagpur, Maharashtra, India

Corresponding Author:
RN Jamdade
M.Sc. Student, Department of Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

Influence of different combinations of herbicides on weed control and growth of wheat

RN Jamdade, SN Potkile, BK Atkari, AJ Yelane and ED Bagde

Abstract
A field experiment was conducted at Agronomy Farm, College of Agriculture, Nagpur during *rabi* season of 2020-21 to evaluate the effect of different combinations of herbicides on weed control and growth of wheat (*Triticum aestivum* L.) on clayey and slightly alkaline soil. The experiment was laid out in randomized block design with ten treatments replicated thrice. Fourteen weed species, viz. *Cynodon dactylon, Cyperus rotundus, Dinebra arabica, Eragrosis major, Commelia benghalensis, Corchorus aestuans, Chenopodium album, Digera arvensis, Convolvulus arvensis, Celosia argentea, Euphorbia hirta, Euphorbia geniculate, Amaranthus viridis* and *Parthenium hysterophorus* infested the wheat field. Results reveal that among all herbicidal treatments, post emergence application of clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} at 35 DAS was found to be the most effective in controlling both monocot and dicot weed population and better height of plant (97.30 cm), number of tillers m^{-1} row length (154.13) and dry matter plant^{-1} (12.65 g) of wheat crop across the crop growth period which resulted in maximum weed control efficiency (88.67%) and lowest weed index (3.76%) followed by post emergence application of sulfosulfuron + metsulfuron methyl @ 0.03 +0.002 kg a.i. ha^{-1} at 35 DAS.

Keywords: Weed, growth, sulfosulfuron, metsulfuron methyl

Introduction
Wheat (*Triticum aestivum* L.) is one of the important food grain crop of India and forms the major part in Indian diet. Yield reduction due to weeds in wheat ranging from 30-50%, depending upon the weed density and type of weed flora. The present situation of labour shortage and increase in wages has only worsened the situation. Under such situations, herbicides are far cheaper and more readily available resource than labour for timely weed control. Therefore, it is inevitable that herbicide use will increase. Wheat is infested with grassy as well as broad-leaved weeds, which requires a variety of herbicides to control mixed population of weeds. When there is complex weed flora (both grassy and broad-leaved) infestation in wheat crop, the efficacy achieved through alone application of herbicide belonging to single group is limited because of narrow spectrum of weed control. The continuous dependence on a single herbicide for a long time, besides resistance development, also leads to a shift in the weed flora (Chancellor, 1979) [1]. In such situations, for broad-spectrum weed control combination or sequential application of herbicides with different selectivity can widen the range of weed control, save time, labour, application cost and also reduces impact of herbicides on environment.

Material and Methods
A field experiment was conducted at Agronomy Section Farm, Collage of Agriculture, Nagpur (Maharashtra) during *rabi* season of 2020-21. Nagpur is in Central Vidarbha Zone of Maharashtra. The ten treatments comprised of pre-emergence application of pendimethalin @ 1 kg a.i. ha^{-1}, metribuzin @ 0.21 kg a.i. ha^{-1}, pendimethalin + metribuzin @ 1.0 + 0.175 kg a.i. ha^{-1} and application of sulfosulfuron @ 0.025 kg a.i. ha^{-1}, clodinafop @ 0.06 kg a.i. ha^{-1}, metsulfuron methyl @ 0.004 kg a.i. ha^{-1}, sulfosulfuron + metsulfuron methyl @ 0.03 + 0.002 kg a.i. ha^{-1}, clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} at 35 DAS as post emergence application, hand weeding twice at 20 and 40 DAS and unweeded control. Spraying was done with the help of manually operated knapsack sprayer fitted with flat fan nozzle using 500 litres of water per hectare. Monocot and dicot weed count (no./m^2) were recorded from three places selected at random in each plot at 30 days intervals. A quadrate of (0.5 x 0.5m) size was used for recording the weed density and weed dry weight.

The weeds within the quadrate were identified and counted and expressed in (no./m^2). Weed dry matter was recorded from three places selected randomly. After sun drying, weeds were dried in hot air oven at 70 ± 1 °C for 48 hours to obtain constant weight. Weed control efficiency was also calculated on the basis of dry matter production by weeds. Data on growth attributes were determined at 30, 60, 90 DAS and at harvest. The data were statistically analyzed by using statistical procedures and comparisons were made at 5% level of significance.

Results and Discussion

Weed Flora

Major weed flora observed on weedy plot comprised *Corchorus aestuans, Chenopodium album, Digera arvensis, Convolvulus arvensis, Celosia argentea, Euphorbia hirta, Euphorbia geniculate, Amaranthus viridis, Parthenium hysterophorus, Cynodon dactylon, Cyperus rotundus, Dinebra arabica, Eragrosis major and Commelia benghalensis*. It was found that in weedy plot, grassy weeds constituted about 39.51%, while broad-leaf weeds 60.48% of the total weed population. Herbicide treatments showed differential influence on weed control in wheat during the year of experimentation.

Effect on Weeds

Application of all the herbicidal treatments showed significant differences in control of monocot, dicot as well as total weeds at 60 DAS (Table 1). Application of clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} and sulfosulfuron + metsulfuron methyl @ 0.03 + 0.002 kg a.i. ha^{-1} PoE provided maximum control of all the groups of weeds at 60 DAS. In general, efficacy of the formulated mixtures was found better in respect of controlling complex weed flora than the sole application of herbicide. Regarding suppression of total weeds, twice hand weeding carried out at 20 and 40 DAS found significantly superior over all other herbicidal treatments and on weedy check.

Among sole applications of herbicides, metsulfuron methyl @ 0.004 kg a.i. ha^{-1} PoE is found at par with sulfosulfuron @ 0.025 kg a.i. ha^{-1} and clodinafop @ 0.06 kg a.i. ha^{-1} in reducing total weed population. Similar lines of results were also noticed for dry weed biomass of monocot, dicot and total weeds at 60 DAS by all the above weed management practices. Similarly, application of clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} and sulfosulfuron + metsulfuron methyl @ 0.03 + 0.002 kg a.i. ha^{-1} PoE recorded 88.67%, 87.04% weed control efficiency and lower weed index 3.76%, 5.59% respectively. The highest weed control efficiency and lowest weed index was observed in hand weeding twice at 20 and 40 DAS treatment (94.78, 0%). The higher weed control efficiency under above said treatment might be due to effective control of grassy and broad leaf weeds which resulted in decreasing dry biomass of weeds and thereby increased weed control efficiency and lower weed index. The results are in accordance with those reported by Malik *et al*. (2013) [3] and Tiwari *et al*. (2015) [6].

Table 1: Weed density (no./m^2), dry matter of weed (gm/m^2), WCE (%) at 60 DAS and weed index (%) at harvest as affected by different treatments

	Treatments	Monocot weed	Dicot weed	Total weed	DMW (gm/m^2)	WCE at 60 DAS (%)	WI (%)
T_1	Pendimethalin @ 1 kg a.i. ha^{-1} (pre-emergence)	5.97 (35.14)	6.37 (40.07)	8.70 (75.21)	9.19 (83.95)	65.25	32.06
T_2	Sulfosulfuron @ 0.025 kg a.i. ha^{-1} (post emergence at 35 DAS)	4.86 (23.11)	4.04 (15.82)	6.27 (38.93)	7.08 (49.62)	79.46	15.08
T_3	Metribuzin @ 0.21 kg a.i. ha^{-1} (pre-emergence)	5.50 (29.75)	5.67 (31.64)	7.86 (61.39)	8.30 (68.39)	71.69	25.07
T_4	Clodinafop @ 0.06 kg a.i. ha^{-1} (post emergence at 35 DAS)	4.50 (19.75)	4.55 (20.21)	6.36 (39.96)	7.21 (51.48)	78.69	16.08
T_5	Pendimethalin + Metribuzin @ 1.0 + 0.175 kg a.i. ha^{-1} (pre-emergence)	5.44 (29.09)	5.23 (26.85)	7.51 (55.94)	8.13 (65.59)	72.85	23.40
T_6	Metsulfuron methyl @ 0.004 kg a.i. ha^{-1} (post emergence at 35 DAS)	4.73 (21.87)	3.83 (14.16)	6.04 (36.03)	6.80 (45.74)	81.06	13.25
T_7	Sulfosulfuron + Metsulfuron methyl @ 0.03 + 0.002 kg a.i. ha^{-1} (post emergence at 35 DAS)	3.22 (9.86)	3.20 (9.74)	4.48 (19.60)	5.64 (31.30)	87.04	5.59
T_8	Clodinafop propargyl + Metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} (post emergence at 35 DAS)	2.90 (7.91)	2.88 (7.79)	4.02 (15.70)	5.28 (27.37)	88.67	3.76
T_9	Hand weeding twice at 20 and 40 DAS.	1.77 (2.63)	1.76 (2.59)	2.39 (5.22)	3.62 (12.60)	94.78	0.00
T_{10}	Unweeded control	8.17 (66.24)	10.02 (99.90)	12.90 (166.14)	15.56 (241.61)	-	44.72
	SE (m) ±	0.13	0.19	0.18	0.26	-	-
	C.D.5%	0.40	0.58	0.53	0.79	-	-
	G.M.	4.70	4.75	6.65	8.03	71.95	17.90

1. (Transformed values, $\sqrt{X + 0.5}$)
2. Figures indicated in the parenthesis are original values.

Effect on Crop

The impact of different weed control treatments was clearly reflected in terms of growth parameters of wheat (Table 2). Among different herbicidal treatment clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} PoE recorded the higher plant height (97.30 cm), number of tillers m^{-1} row length (154.13) and dry matter production $plant^{-1}$ (12.65 g) followed by sulfosulfuron + metsulfuron methyl @ 0.03 + 0.002 kg a.i. ha^{-1} recorded 96.85 cm, 151.64 and 12.40 g for plant height, number of tillers m^{-1} row length and dry matter

production plant^{-1} respectively. The reason for lower yields in case of clodinafop, sulfosulfuron and metsulfuron alone as compared to clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} PoE and sulfosulfuron + metsulfuron methyl @ 0.03 + 0.002 kg a.i. ha^{-1} could obviously be due to less control of broad-leaved and grassy weeds, respectively. These results are in conformation with those of Patel *et al*. 2017 [4] and *et al*. 2018 [5].

Table 2: Height of plant (cm), number of tillers m^{-1} row length, dry matter plant^{-1} (g) as affected by different treatments.

	Treatments	height of plant (cm) at harvest	No. of tillers m^{-1} row length at 60 DAS	dry matter plant^{-1} (g) at harvest
T_1	Pendimethalin @ 1 kg a.i. ha^{-1} (pre-emergence)	90.56	102.23	9.35
T_2	Sulfosulfuron @ 0.025 kg a.i. ha^{-1} (post emergence at 35 DAS)	95.20	137.60	11.42
T_3	Metribuzin @ 0.21 kg a.i. ha^{-1} (pre-emergence)	92.33	114.00	10.10
T_4	Clodinafop @ 0.06 kg a.i. ha^{-1} (post emergence at 35 DAS)	94.66	134.40	11.15
T_5	Pendimethalin + Metribuzin @ 1.0 + 0.175 kg a.i. ha^{-1} (pre-emergence)	92.83	116.10	10.29
T_6	Metsulfuron methyl @ 0.004 kg a.i. ha^{-1} (post emergence at 35 DAS)	95.30	139.59	11.58
T_7	Sulfosulfuron + Metsulfuron methyl @ 0.03 + 0.002 kg a.i. ha^{-1} (post emergence at 35 DAS)	96.85	151.64	12.40
T_8	Clodinafop propargyl + Metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} (post emergence at 35 DAS)	97.30	154.13	12.65
T_9	Hand weeding twice at 20 and 40 DAS.	98.03	161.53	13.05
T_{10}	Unweeded control	80.16	87.33	8.55
	SE (m) ±	0.46	3.78	0.24
	C.D.5%	1.39	11.23	0.73
	G.M.	93.32	129.85	11.05

Conclusion

Based on experimental findings, it can be concluded that Among the herbicides, post-emergence application of clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha^{-1} controlled the monocot and dicot weed population and lowered the dry matter of grassy and broad-leaved weeds, Similarly, observed higher height of plant, No. of tillers m^{-1} row length, dry matter plant^{-1}, weed control efficiency and lower weed index was recorded followed by treatment sulfosulfuron + metsulfuron methyl @ 0.03 +0.002 kg a.i. ha^{-1}. Hence, in situation where timely weeding is not feasible due to paucity and high cost of labour as well as unfavorable weather and unworkable field condition, combinations of post emergence herbicide application such as clodinafop propargyl + metsulfuron methyl @ 0.06 + 0.004 kg a.i. ha-1 and sulfosulfuron + metsulfuron methyl @ 0.03 +0.002 kg a.i. ha-1 found suitable for better weed control in irrigated wheat.

References

1. Chancellor RJ. The long-term effects of herbicides on weed populations. Annals of Applied Biology. 1979;91(1):141-144.
2. FAO. Food and Agriculture organization of the United Nation; c2019. (http:// www.fao.org.statistic/en/).
3. Malik RS, Yadav A, Kumar R. Ready mix formulation of clodinafop- propargyl + metsulfuron-methyl against complex weed flora in wheat. Indian Journal of Weed Science. 2013;45(3):179-182.
4. Patel BD, Chaudhari DD, Patel VJ, Patel HK, Aakash Mishra, Parmar DJ, Influence of broad-spectrum herbicides on yield and complex weed flora of wheat (*Triticum aestivum* L.). Research on Crops. 2017;18(3):433-437.
5. Sahu R, Sharda K, Kumar D, Mandal SK. Weed population, weed biomass and grain yield of wheat as influenced by herbicides application. Indian Journal of Weed Science. 2018;50(3):302-304.
6. Tiwari A, Verma BK, Dev J, Kumar RBio-efficacy of clodinafop-propargyl + metsulfuron-methyl against complex weed flora in wheat. Indian Journal of Weed Science. 2015;47(4):422–424.