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Effect of different herbicide on yield and yield attributes of wheat in Punjab region

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Abstract
The experiment was conducted at experimental site of Chandigarh University Gharuan (Mohali) during Rabi season of 2020-2021. Twelve treatments comprising Topik (333 and 400 g ha^{-1}), Pumasuper (600 and 800 g ha^{-1}) Sulfosulfuron (26.6 and 33.3 g ha^{-1}), Sencor (200 and 250 g ha^{-1}), Grasp (3500 g ha^{-1}), Isoproturon (1000 g ha^{-1}), Weed free and weedy check were tested in a randomizeci block design with 3 replication. Phalaris minor Retz, Medicago denticulata, Auagallis arvensis L., Fumaria parviflora L., Lathyrus aphaca L. and Vicia sativa L. were the predominant weeds present in the experimental field. Among the various weed control treatments weed free and sencor at 200 g ha^{-1} and 250g ha^{-1} give significantly higher grain yields of 45.88, 45.31 and 43.86 q ha^{-1} respectively and were at par with one another. These treatments had significantly higher number of effective tillers and larger ear length which exhibited more number of grains per earhead and higher test weight as compared to rest of treatments. Application of grsap at 3500g ha^{-1} was next in superiority but produce significantly lesser grain yield as compared to weed free and sencor at 200 g ha^{-1} and 250 g ha^{-1} due to lesser weed control efficency and proved to be statistically superior to rest of the treatments. Application of Sulfosulfuron (26.6 and 33.3g ha^{-1}) indicated significant reduction in grain yield of wheat as compared to weed free, Sencor (200 and 250 g ha^{-1}) and isoproturon (1000 g ha^{-1}) due to lesser control of broad leaved weeds. However, Topik (333 and 400 g ha^{-1}) , Pumasuper (600 and 800 g ha^{-1}) and Grasp (3500 g ha^{-1}) remained completely ineffective against broad leaved weeds and recorded significantly lower grain yield than other weed control treatments.

Keywords: phalaris minor, cultivation, herbicides, yield and yield attributes of wheat

Introduction

Wheat (*Triticum aestivum*) is the world's second most important cereal crop after rice and one of the most important stable food crops. Wheat is a cereal grain that originated in the Levant region but is now grown in at least 43 countries around the world (Feldman and Mordechai, 2007). China, Thailand, Indonesia, and the United States of America are the world leaders in wheat cultivation. It cultivated on an area of 215 million ha and produced 765.41 million metric tonnes (Anonymous, 2019). After China, India is the world's second largest producer of wheat. Wheat is India's second most important stable food crop, after rice, and is grown on approximately 29 million ha with a production of 106.21 million tonnes (Anonymous, 2019-2020). It is the backbone of India's food security. It is used to make bread, cakes, cookies, noodles, Petri-products, and chapatti, among other things. Wheat grains contain 60-68 percent starch, 8-15 percent protein, 1.5-2.0 percent fat, 2.0-2.5 percent cellulose, and 1.5-2.0 percent minerals (Rathore, 2001). Wheat cultivation area in the Punjab region is 3.4 million ha, with a production of 14.9 million tonnes and a productivity of 4.3 tonnes per ha (Anonymous, 2019-2020). Wheat production and productivity have been trending downward over the last five years. In the rice-wheat cropping system, *Phalaris minor* Retz. is still the most pernicious and competitive weed in wheat in Punjab, causing significant yield losses in north-west India, including the states of Punjab, Haryana, and Western Uttar Pradesh in the Indo-Gangetic Plains of India. Many researchers have reported severe reductions in wheat grain yield. The use of isoproturon in wheat for more than a decade resulted in the emergence of resistance in P. minor in the early 1990s (Malik and Singh 1993, Walia et al. 1997). It was widely used by farmers due to its low cost, wider application window, flexibility in application method, and broad-spectrum weed kill, as well as its fair selectivity under wheat-mustard intercropping (Chhokar et al. 2009). Other herbicides introduced after isoproturon, such as clodinafop, fenoxaprop, and sulfosulfuron, performed reasonably well for several years. P. minor is resistant to fenoxaprop, clodinafop, sulfosulfuron, and pinoxaden in Punjab. Different weed species are known to consume a significant amount of inputs, particularly nutrients and water, resulting in a scarcity of these resources for the associated crop. This strongly supported the need for effective weed management. Phalaris minor accounts for 20-25 percent of grassy weed infestation, which may be as high as 90 percent in some areas of different states (Singh and Singh, 1981). Weeds such as *Phalaris minor* and *Avena* species resemble wheat in morphology until the heading stage. Furthermore, their successive emergence in phases with very high density, high reproductive potential, and shedding of seeds about 2 to 3 weeks before wheat harvesting are some of the unique characteristics that have made traditional control difficult. Furthermore, traditional and mechanical methods based on manual operations are laborious, costly, and time consuming, requiring the use of selective herbicides for effective weed flora control.

Material and Methods

The experiment was conducted at experimental site of Chandigarh University Gharuan (Mohali) during Rabi season of 2020-2021 that lies between 30.7691 N latitude and 76.5759 E longitude at an altitude of 296.86 metre

above the mean sea level. The climate is subtropical type characterized by very hot summers and severe winters. The average annual precipitation over past twenty five year is 792mm and more than 80 percent of precipitation is received during south wst monsoon. During crop growth (10^{th} dec to 28 april wettest monsoon was December. The mean maximum and minimum temperature for entire crop growth period of wheat crop was 38.83 C and 3.59 C, respectively. The experimental site showed that the soil was clay loam in texture, neutral in reaction, low in organic carbon, available nitrogen, and medium in available potassium, and phosphorus. The trail was laid out in Randomized Block design with three replications having twelve treatments. In which there were pre and post herbicides Topik (333 and 400 g ha^{-1}), Pumasuper (600 and 800 g ha^{-1}), Sulfosulfuron (26.6 and 33.3 g ha^{-1}), Sencor (200 and 250 g ha^{-1}), Grasp (3500 g ha^{-1}), Isoproturon (1000 g ha^{-1}), weed free and weedy check. The experimental fields were prepared with the help of power tiller. The layout of experiment was carried out manually and plots were prepared and then levelled. Sowing of wheat was done keeping row spacing of 22.5 cm. Seed rate of 100 kg ha^{-1} for wheat was used. The recommended dose of NPK in wheat crop used was 105kg N, 75 kg P_2O_5 and 50 kg K_2O ha^{-1} in irrigated condition, respectively. Half dose of nitrogen and whole P_2O_5 andK_2O were incorporated in soil, as per the treatments, as basal dose and remaining half dose of nitrogen was top dressed at tillering stage of the wheat crop. Inter culture, weeding and other palnt protection measures are done according to the need. To obtain the true treatment effects, four outer rows (two on each side) and 0.25 m on either side of each row were removed and then net plot of 5 m x 3 m was harvested with the help of combine.

Result and discussion

Effective tillers/ mrl

Different herbicides significantly affected the effective tillers per metre row length (Table 1). Statistical analysis showed that maximum effective tillers/ mrl (104.38) was recorded for weed free (T_{11}) while the minimum effective tillers/mrl (88.44) was observed in weedy check (T^{12}). Baldha *et al*. (1998) who investigated that herbicides application significantly influenced the number of tillers m^{-2} concur with our results.

Earlength

The statistical data showed significant effect on ear length (Table 1). Ear length was maximum (12.26) in weed free (T_{11}) followed by sencor at 250g ha^{-1} (12.25) whereas minimum length (10.40) was recorded from Topik 15 WP. Our findings are in an analogy with the work of Khalil *et al.* (1999). They reported that application of post- emergence herbicides in wheat crop produced the highest spikes length.

No of grains/ Spike

The statistical data showed significant effect on No of grains/ spike (Table 1). No of grain was maximum (41. 05) in weed free (T_{11}) followed by sencor at 250g ha^{-1} (40. 48) whereas minimum grains/ear head (37.11) was recorded from Topik 15 WP. These results are supported by earlier researchers (Hashim *et al*., 2002) who reported that herbicidal treatments significantly increased the grains per spike in wheat crop.

Test weight

The statistical data showed significant effect on test weight (Table 1). Test weight was maximum (41.44 g) in weed free (T_{11}) followed by sencor at 250g ha^{-1} (40.85g) whereas minimum weight (37.16 g) was recorded from Topik 15 WP. Similar results were reported by Hassan *et al.* (2003) who found that herbicides increased the 1000 grain weight significantly when compared with the weedy check. And These results are in conformity with those reported by Singh *et al.,* (2000), Amin *et al.,* (2003), Raghavan & Hariharan (1991) and Yadav *et al.,* (1995) who stated that grain weight increases with the application of some herbicides.

Table 1: Effect of different treatments on yield attributes in wheat

Treatments	Effective Tillers/mrl	Ear length (c.m)	No of grains/ spike	Test weight (g)
(T1) Topik 15 WP @ 333g ha^1	93.66	10.40	37.11	37.16
(T2) Topik 15 WP @ 400g ha^1	93.88	10.69	37.46	37.30
(T3) Pumasuper @ 600g ha^1	93.61	10.66	37.19	37.23
(T4) Pumasuper @ 800g ha^1	93.36	10.77	37.41	37.32
(T5) Sulfosulfuron @ 26.6g ha^1	95.05	11.16	37.49	37.88
(T6) Sulfosulfuron @33.3g ha^1	96.82	11.11	38.32	38.74
(T7) Sencor @ 200 g ha^1	100.92	11.79	39.30	40.17
(T8) Sencor @ 250 g ha^1	104.32	12.25	40.48	40.85
(T9) Grsap @3500g ha^1	98.84	11.69	39.22	39.40
(T10) Isoproturon 75 WP@ 1000g ha^1	98.28	11.49	38.57	38.71
(T11) weed free	104.38	12.26	41.05	41.44
(T12) weedy check	88.44	11.48	37.59	38.70
C.D	0.45	0.41	0.27	0.28

Grain yield

All herbicides for weed management significantly affect grain yield. Table 2 demonstrated the effect of different herbicides on grain yield. The maximum value of grain yields of (45.88 q/ha^{-1}) was observed in weed free plot followed by sencor at 250g (45.31q/ha^{-1}). Minimum value of grain yields of (31.74 q/ha^{-1}) was observed in Topik 15WP at 333g plots.

Puma-Super and Topik registered lower yield because they did not control narrow leaf weeds. These results agree with those of Hussain *et al.* (2003). and the findings of Awan *et al*. (1990), Tanveer *et al*. (1993), Fayed (1998), Arif *et al*., (2004), Hassan *et al*. (2003) , Tunio *et al*. (2004), Hashim et al. (2002) and Montazeri (1994) who reiterated the efficacy of herbicide applications having been influential in raising the grain yield of wheat .

Straw yield

The maximum value of straw yields of (71.17 q/ha^{-1}) was observed in weed free plot followed by sencor at 250g (71.11 q/ha^{-1}). Minimum value of straw yields of (54.23 q/ha^{-1}) was observed in Topik 15WP at 333g plots.

Table 2: Effect of different treatments on grain yield, straw yield and harvesting index

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvesting Index (%)
(T1) Topik 15 WP @ 333g ha^{1}	31.74	54.23	36.5
(T2) Topik 15 WP @ 400g ha^{1}	37.07	58.78	37.5
(T3) Pumasuper @ 600g ha^{1}	34.65	56.85	38.0
(T4) Pumasuper @ 800g ha^{1}	37.14	58.85	38.6
(T5) Sulfosulfuron @ 26.6g ha^{1}	39.67	61.99	38.7
(T6) Sulfosulfuron @33.3g ha^{1}	41.75	65.03	38.9
(T7) Sencor @ 200 g ha^{1}	43.86	68.04	39.0
(T8) Sencor @ 250 g ha^{1}	45.31	71.11	39.1
(T9) Grsap @3500g ha^{1}	42.01	66.19	38.9
(T10) Isoproturon 75 WP@ 1000g ha^{1}	41.69	65.44	38.8
(T11)weed free	45.88	71.17	39.1
(T12)weedy check	40.78	64.36	38.8
C.D	0.23	0.20	0.91

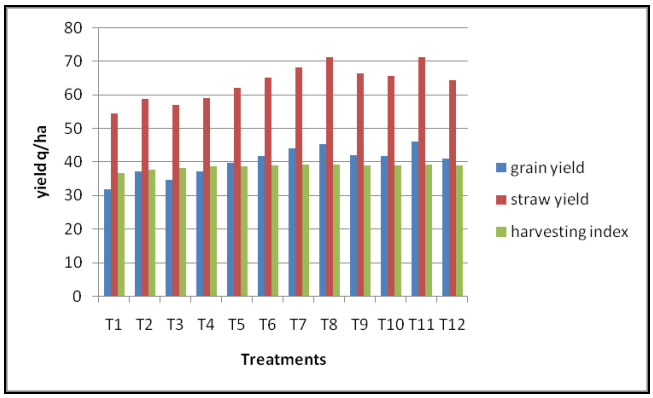

Fig 1: Effect of different herbicides on yield attributes

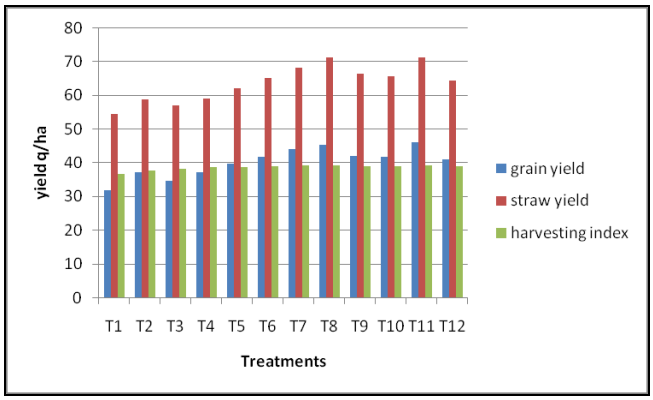

Fig 2: Effect of different herbicide on grain yield, Straw Yield and harvesting index of wheat.

Conclusion

Among the various weed control treatments weed free and sencor at 200 g ha^{-1} and 250g ha^{-1} give significantly higher grain yields of 45.88, 45.31 and 43.86 q ha^{-1} respectively and were at par with one another. These treatments had significantly higher number of effective tillers and larger ear head length which exhibited more number of grains per earhead and higher test weight as compared to rest of treatments. Application of grsap at 3500g ha^{-1} was next in superiority but produce significantly lesser grain yield as compared to weed free and sencor at 200 g ha^{-1} and 250 g ha^{-1} due to lesser weed control efficency and proved to be statistically superior to rest of the treatments. Similarly, with the application of sulfosulfuron at 26.6 and 33.3g ha^{-1} the grain yield was significantly reduced due to poor weed control efficency in respect of broad leaved weeds, whereas, these treatments recorded better control of phalaris minor. The application of topik at 333 and 400 g ha^{-1} , pumasuper at 600 and 800 g ha^{-1} and isoprotorun at 1000g ha^{-1} reduced phalaris minor dry matter signifcantly but remained completey ineffective in controlling broad leaved weeds and thus resulting in significantly lower grain yield.

References

1. Amin R, Khalil SK, Asim M. Phenological development and weeds dry matter production in canola as affected by pre and post emergence herbicides and row spacing. Pak. J. Weed Sci. Res,2003:9(3-4):201-208.
2. Anonymous. The world agriculture production (July, 2019), United States Department of Agriculture (USDA), 2019.
3. Anonymous, Wheat Production and Productivity of Punjab (ICAR), 2019-2020.
4. Arif M, Awan L, Khan HU. Weed management strategies in wheat (Triticum aestivum L.). Pak. J. Weed Sci. Res,2004:10(1-2):11-16.
5. Baldha NM, Patel JC, Malavia DD, Kavani HD. Efficacy of herbicides on weed control in irrigated wheat. Indian J. Weed Sci,1998:20(1):89-90.
6. Chhokar RS, Sharma RK, Sharma I. Weed management strategies in wheat- A review. Journal of Wheat Research,2009:42:1-21.
7. Fayed TB, Sabry S, Aboul-Ela S. Effect of wild oat herbicides on weed density, wheat grain, and yield components. Annals Agri. Sci. Cairo,1998:43(1):173-188.
8. Feldman MK, Mordechai E. Domestication of emmer wheat and evolution of free threshing tetraploid wheat in “A Century of Wheat Research from Wild Emmer Discovery to Genome Analysis. Israel journal of Plant Sciences,2007:55(3):207-221.
9. Hashim S, Marwat KB, Hassan G. Response of wheat varieties to substituted urea herbicides. Pak. J. Weed Sci. Res,2002:8(1-2):49-56.
10. Hassan G, Faiz B, Marwat KB, Khan M. Effects of planting methods and tank mixed herbicides on

controlling grassy and broadleaf weeds and their effect on wheat. Pak. J. Weed Sci. Res,2003:9(1-2):1-11.
11. Hussain N, Khan MB, Khan B, Tariq M, Hanif S. Spectrum of activity of different herbicides on wheat. Intl. J. Agri. Biol,2003:5(2):166-168.
12. Khalil SK, Khan AZ, Shah P, Baloch AR, Malik MF. Herbicides and row spacings effect on leaf characteristics and grains spike-1 of wheat. Sarhad J. Agric,1999:16(1):13-17.
13. Malik RK, Singh S. Evolving strategies for herbicide use in wheat: resistance and integrated weed management. In: Integrated Weed Management for Sustainable Agriculture. Proceedings of the International Symposium, (Ed. Malik RK), Indian Society Weed Science, Hisar, India, 1993, 225-38.
14. Montazari M. Efficiency of several herbicides in control of weeds in wheat. Iranian J. Pl. Path,1994:30(4):69-77.
15. Raghavan K, Haribaran NM. Effect of 2,4-D pre-sowing seed treatment on growth and yield of Brassica juncea (L.) Cosson. Acta Botanica Indica,1991:19(10):13-17. [Weed Absts., 41: 1809; 1992].
16. Rathore AL. Studies on nitrogen and irrigation requirement of late sown wheat. Indian Journal of Agronomy.2001:46(4):659-664.
17. Singh G, Singh D. Control of Phalaris minor in wheat. Indian Farmer Digest,1981:14(10):9-12.
18. Singh SK, Jain NK, Poonia BL. Integrated weed management in Indian mustard (Brassica juncea). Indian J. Agric. Sci,2000:70(12):850-852.
19. Tanveer D, Sahil G, Dejene D. Potential benefits of herbicidal weed control for bread wheat production in the present farming systems of South Eastern Ethiopia. Trop. Agric,1993:7(3):260-266.
20. Tunio SD, Kaka SN, Jarwar AD, Wagan MR. Effect of integrated weed management practices on wheat yield. Pak. J. Agric. Engg. Vet. Sci,2004:20(1):5-10.
21. Walia SS, Brar LS, Dhaliwal BK. Resistance to isoproturon in Phalaris minor Retz. in Punjab. Plant Protection,1997:12:138-140.
22. Yadav RP, Shrivastava UK, Yadav KS. Yield and economic analysis of weed-control practices in Indian mustard (Brassica juncea). Indian J. Agron,1995:40(1):122-124.