EFFECT OF SOWING PATTERN AND HERBICIDES APPLICATION ON WEED MANAGEMENT IN WHEAT CROP

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DOI: https://doi.org/10.28941/pjwsr.v27i1.915

ABSTRACT

A field experiment was conducted at the New Developmental Research Farm, the University of Agriculture Peshawar during rabi season 2016-17. A wheat variety Ata-Habib was selected to check its performance by adopting methods of sowing and mixed tank herbicides application. The experiment was arranged in split-plot with randomized complete block (RCB) design with 4 replications. For practical adaptation of the experiment, the sowing methods were allotted as the main plots, while tank mixed herbicides were kept in the sub-plots to get prominent results for the possible positive differences among the treatments. The sub-plot size measured as 1.5 X 3 m while row to row distance was kept 30 cm. Data were recorded on weed density m^{-2}, fresh and dry weed biomass (kg) , plant height (cm), spike length (cm), leaf area (cm), number of tillers (m^{-2}), number of grains $spike^{-1}$, 1000 grain weight (g), biological yield (kg ha^{-1}) and grain yield (kg ha^{-1}), Harvest index (%). These data parameters were formally observed with great care to avoid any repetition or error of the data. Noxious weeds were observed and recorded in the field viz. *Avena fatua, Anagallis arvensis, Euphorbia helioscopia, Phalaris minor, Poa annua, Medicago denticulata, Convolvulus arvensis, Coronopus didymus, Fumaria polymorpha, Melilotus parviflora, Chenopodium album* and *Rumex crispus*. The obtained results indicated that sowing methods were statistically significant for plant height, grains $spike^{-1}$,1000grain weight and biological yield that showed a clear effectiveness of the recorded data parameters. In addition to this, herbicides applications were also statistically significant for all the parameters except grains $spike^{-1}$, while the interaction of sowing methods and herbicides application were also non-significant. In sowing methods, line sowing provided satisfactory results. As general understandings various weeds were managed significantly through tank mixed herbicide applications with a ratio of 60-72% for broad leaf and grassy weeds respectively. Consequently the instant results provided 54% increased yield compared to the untreated treatments. Hence it is concluded that, line sowing in combination with tank mixed herbicides are more suitable for management of weeds in the wheat field and increased yield in the agro-climatic conditions of Peshawar-Pakistan.

Key words: sowing pattern, herbicides, weed management, wheat crop

Citation: Khan, I., M. Kabir, M.I. Khan, H. Khan, S. Hashim and M. A. Khan. 2021. Isolation of Allium Sativum And Mentha Piperita Extracts; Evaluation Of Their Antioxidant And Anti-Tyrosinase Activities In-Vitro. Pak. J. Weed Sci. Res., 27 (1):67-78.

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is an annual winter and self-pollinated crop with a long day photoperiod. It is the most important and major crop among cereals in Pakistan and in many other countries as it satisfies the daily calories intake of human and the raw material especially the wheat straw is being used by cattle. The total area covered by wheat crop during year 2014 and 2015 was recorded about 9039 thousand hectares whereas the production was 25286 thousand tons in Pakistan. Meanwhile in Khyber Pakhtunkhwa province, the total area and production was 636309 hectares and 1149873 tons, respectively. The ordinary yield of wheat in Pakistan is 2797 kg ha^{-1} and in Khyber Pakhtunkhwa province it is 1807 kg ha^{-1}(MINFA, 2015) which is too less than the potential yield. In Pakistan, various factors responsible for low yield. Among those factors, weeds attacks are the key factors of low yield in wheat. Weed infestations causing severe problems in wheat crop, as the average yield reduction is up to 25-30% (Bansal *et al.,* 1992).

Weeds are causing loss in yield due to competition for nutrients, space, light and moisture with crops. In Khyber Pakhtunkhwa province, cultural and chemical weed management practices have been implemented since decades. The associated weeds of wheat include: *Cirsium arvense* L, *Poa annua, Convolvulus arvensis* L, *Avena ftua* L, *Chenopodium album*, *Carthamus oxycantha* L. *Ammi visnaga*, *Fumaria indica* L, *Cynodon dactylon* L, *Phalaris minor* L are the most problematic in Khyber Pakhtunkhwa province in Pakistan (Hassan *et al*., 2007).

The physical and chemical weed control management's practices include i.e. Hand weeding and herbicide application used efficiently but it's too much costly (Cheema *et al.* 2003).

However, the introduction of various crops sowing techniques like: conventional drilling and precision drilling in winter wheat have been practiced since long time ago in which broadcasting is comparatively effective techniques (Carver, 2005). Still no consistent relationship was found between the successive yield performance and spatial arrangement (Singh *et al*., 2005). Like as, higher growth was resulted in grain yield with strip drilling and the results were followed by tillage drilling, bed planting and conventional sowing in wheat crops in Uttar Pradesh India (Ahuja *et al*., 1996). Commonly, farmer's mix the broad leaves with grasses herbicides to reduce weed interference in crops. Bromoxynil plus MCPA and Dichlorprop-*p* plus MCPA are auxin-type herbicides with growth controlling effects (Mousavi *et al.,* 2005). It has also been tested that the translocation of grass herbicides was found lowered when mixed with ALS-seizing herbicides (Burke and Wilcut, 2003) or auxin-type herbicides (Mousavi *et al.,* 2005). Nelson *et al.* 1998 reported up to 25% decline in grass control efficiency of clodinafop-propargyl after mixing with 2, 4-D or MCPA, while no contrary effects were checked in case of broadleaved weed control. In difference, the efficacy of grass weed control with clethodim and sethoxydim was not affected when tank was mixed with broadleaved herbicides.

Keeping in mind the effectiveness of the above mentioned methods of weed management, a comprehensive field trial were carried out 1) to evaluate the effect of sowing geometry and different herbicides application on weed management in wheat field. 2) to determine the effects due to usage of different herbicides alone and in tank mixture against weeds for better yield.3) to discover the most suitable herbicide for weed control in wheat crop.

MATERIALS AND METHODS

The experiment was carried out at New Development Farm (NDF), The University of Agriculture Peshawar, in season 2016-17. The research was organized in randomized complete block (RCB) design with split plot arrangement with three replications. The method of line sowing and broadcasting was mentioned in each replication. The seeds were spread for sowing at the rate of 120 kg ha^{-1}in line sowing and a higher 150 kg ha^{-1} was sown in broadcasting. Ata Habib variety was used in the experimental trail. The recommended rate of NP fertilizer was applied to the field at the rate of 120:60 kg $ha^{-1}$with sowing of wheat crop. For weed control different pre emergence and post emergence herbicides were used. All herbicides were applied alone as well as tank mixed.

Table-01: Detail of the experimental treatment

S. No.	Common name	Trade name	a.i ha^{-1}	Pre/post emergence
1	Pendimethaline	Stomp	1.25	Pre-emergence
2	Bromoxynil +MCPA	Buctril	0.72	Post-emergence
3	Isoproturon	Arelon	1.12	Post-emergence
4	Pendimethaline +Bromoxynil+MCPA	Stomp+Buctril+MCPA	1.25+0.72	Post-emergence
5	Pendimethaline + Isoproturon	Stomp+ Arelon	1.25+1.12	Post-emergence
6	Isoproturon + Bromoxynil +MCPA	Arelon+ Buctril+MCPA	1.12+0.72	Post-emergence
7	Control	-----	----	-----

The data were recorded on weed density (m^{-2}), fresh weed biomass (kg), Dry Weed Biomass (kg), Number of grains $spike^{-1}$, 1000 grain weight (g), Biological yield (kg ha^{-1}) and Grain yield (kg ha^{-1}).

Data Statistical Analysis

The experimental data was recorded for each and every trait distinctly using the procedures applicable on RCB design with split plot arrangements. Test for finding differences among the treatments have been applied for data analysis at5% level of probability (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Weed density (15 days) m^{-2}

The means data regarding the weed density after fifteen days from herbicide application was found significantly different in the treatments. The individual effects of various treatments, sowing methods and the interactions were observed significant (Table-1a).The means data of sub plot regarding treatment application showed that the minimum weed density (14.90 and 15.40 m^{-2}) were recorded in Pendimethaline + Bromoxnil MCPA treatments followed by Pendimethaline + Isoproturon in combination. Whereas, the maximum weed density (19.75 and 18.70 m^{-2}) after fifteen days was noted for weedy check followed by Bromoxnil MCPA treated plots. The reasons for the differences may be, the combination of tank mixed herbicides that controlled both grassy and broad leaf weed and reduced the weed density in the respective treatments. Gul *et al*., (2002) concluded that wheat crop sown in line

sowing reduced the weed density and maximize the crop growth as compare to broadcasting where the crop are less competitive to weeds.

Data concern to treatments application and sowing method (interaction) after fifteen days shows significant difference, where the lowest weed density (14.15 and 14.45 m^{-2}) was noted for Pendimethaline + Bromoxnil MCPA× line sowing followed by Pendimethaline + Isoproturon× line sowing. While, highest weed density (21.35 and 20.25 m^{-2}) was observed for weedy check× broadcasting that was kept undisturbed. In the case of Pendimethaline + Bromoxnil MCPA and Pendimethaline + Isoproturon herbicides integration with line sowing gave maximum weed control due its more efficiency where the crop got an opportunity for maximum growth in the absence of the weeds.

Table-1a.Weed density (m^{-2}) after 15 days of application of herbicide treatment.

Treatments	Sowing Method		Means
	Line Sowing	Broad Casting	
Pendimethaline	16.35 h	19.65 c	18.00 c
Bromoxnil MCPA	17.15 f	20.25 b	18.70 b
Isoproturon	15.65 i	19.15 d	17.40 d
Pendimethaline+ Bromoxnil MCPA	14.15 l	15.65 i	14.90 g
Pendimethaline+ Isoproturon	14.45 k	16.35 h	15.40 f
Isoproturon+ Bromoxnil +MCPA	14.85 j	16.95 g	15.90 e
Weedy check	18.15 e	21.35 a	19.75 a
Means	15.82 b	18.48 a	

Weed density (60 days) m^{-2}

The means of the data showed that the weed density after sixty days after herbicide application was found significantly different with each other (Table-1b). The various treatments sowing methods and their interactions were found significantly different. The minimum weed density (23.28 and 23.78 m^{-2}) was recorded for Pendimethaline + Bromoxnil MCPA followed by Pendimethaline + Isoproturon. However, while maximum weed density (28.13 and 27.08 m^{-2}) after sixty days was founded for weedy check and then Bromoxnil MCPA treated plot. The reasons may be due to its combine effects in initial stage which can greatly inhibited both grassy and broad leaves weed and decreased its density. About (main plots) sowing methods, where less weed density after sixty days (22.47 m^{-2}) was recorded for line sowing. Although, high weed density (28. 56 m^{-2}) were found for treatments sown with broadcasting. The growing of wheat crop in line sowing provides maximum weed control while on the other hand weeds grow vigorously with higher densities in the crop sown with broadcasting method. Our findings are same to Gul *et al*., (2002) who stated that wheat crop either sowing in line sowing reduced the weed density and increased crop growth and yield.

The interactions effect was significant , where the lowest weed densities (20.83 and 21.13 m^{-2}) were recorded in Pendimethaline + Bromoxnil MCPA× line sowing followed by Pendimethaline + Isoproturon × line sowing. Whereas, the maximum weed density (31.43 and 30. 33 m^{-2}) were recorded for weedy check × broadcasting followed by Bromoxnil MCPA × broadcasting combination. Pendimethaline + Bromoxnil MCPA and Pendimethaline + Isoproturon in integration with line sowing method where we have found maximum weed control

because both the herbicides controlled the weeds efficiently and the crops yielded better production comparatively.

Table-1c.Weed density (m^{-2}) after 60 days of application of herbicide treatment

Treatments	Sowing Method		Means
	Line Sowing	Broad Casting	
Pendimethaline	22.81 j	29.73 c	26.27 c
Bromoxnil MCPA	23.83 i	30.33 b	27.08 b
Isoproturon	22.33 k	29.23 d	25.78 d
Pendimethaline+Bromoxnil MCPA	20.83 n	25.73 g	23.28 g
Pendimethaline+ Isoproturon	21.13 m	26.43 f	23.78 f
Isoproturon+ Bromoxnil + MCPA	21.53 l	27.03 e	24.28 e
Weedy check	24.83 h	31.43 a	28.13 a
Means	22.47 b	28.56 a	

Weed density (120 days) m^{-2}

The means of weed density after one twenty days was found significantly different with each other (Table-1c). The different treatments and sowing method and their interaction exhibited significant mean data of the treatment (sub plots) application illustrate that the lowermost weed density (21.08 and 21.58 m^{-2}) were recorded for Pendimethaline + Bromoxnil MCPA followed by Pendimethaline + Isoproturon. Though, the uppermost weed density (25.93 and 24.88 m^{-2}) after sixty days was observed for weedy check followed by Bromoxnil MCPA plot. The reason may be that, synergic effect of herbicides were more effective for broad and grassy leave weed in wheat crop.

Regarding sowing method (main plots) where the lower weed density sixty days (20.25 m^{-2}) was noticed for line sowing. Although, the higher weed density (26. 36 m^{-2}) were found in the plots sown with broadcasting. The line sowing in wheat gave greatly weed control while on the other hand weeds grow vigorously with higher densities in the crop sown with broadcasting. According to Gul *et al*., (2002) who reported the wheat crop sowing in line sowing decreased the weed density and improve the crop production as compare to broadcasting where less competition to weeds. The interactions of treatments and sowing method shows significant variation where the smallest weed density (18.63 and 18.93 m^{-2}) were seemed for Pendimethaline + Bromoxnil MCPA× line sowing and then Pendimethaline + Isoproturon × line sowing. Whilst, the largest weed density (29.23 and 28.13 m^{-2}) after one hundred and twenty sixty days were investigate for weedy check × broadcasting method. So, the integration of line sowing and synergic effect of herbicides resultant highest weed control that could be efficiently to get opportunity for maximized the yield of crops.

Table-1c.Weed density (m^{-2}) after 120 days of application of herbicide treatment

Treatments	Sowing Method		Means
	Line Sowing	Broad Casting	
Pendimethaline	20.50 j	27.53 c	24.01 c
Bromoxnil MCPA	21.63 i	28.13 b	24.88 b
Isoproturon	20.13 k	27.03 d	23.58 d
Pendimethaline+ Bromoxnil MCPA	18.63 n	23.53 g	21.08 g
Pendimethaline+ Isoproturon	18.93 m	24.23 f	21.58 f
Isoproturon+ Bromoxnil + MCPA	19.33 l	24.83 e	22.08 e
Weedy check	22.63 h	29.23 a	25.93 a
Means	20.25 b	26.36 a	

Fresh weed biomass (kg)

Data regarding fresh weed biomass was found significantly different with each other (Table-2). Different treatments, sowing methods and their interaction exhibited significant differences. Treatment application (sub plots) produced low fresh weed biomass (394.55 and 417.13 kg) that were noted for Pendimethaline + Bromoxnil MCPA and then Pendimethaline + Isoproturon. Whereas, the maximum fresh weed biomass (719.13 and 653.05kg) were noted for weedy check followed by Bromoxnil MCPA plot. About the sowing method (main plots) indicated the minimum fresh weed biomass (517.14 kg) was founded for sown in line sowing. Though, the maximum fresh weed biomass (564.74 kg) was investigated for broadcasting method. The wheat crop in line sowing provides optimum weed control while weeds grow vigorously with higher densities in broadcasting crop. These observations are same to Gul *et al*., (2002) who stated wheat crop sowing in line sowing reduced the weed density and enhanced the crop growth as well yield components. The fresh weed biomass interactions (treatments and sowing method) shows that where the lowest fresh weed biomass (371.13 kg and 393.13kg) were noted for Pendimethaline + Bromoxnil MCPA× line sowing and then Pendimethaline + Isoproturon × line sowing. However, the highest fresh weed biomass (743.13 and 676.79kg) was noticed for weedy check × broadcasting followed by Bromoxnil MCPA × broadcasting method. The combination of Pendimethaline + Bromoxnil MCPA and Pendimethaline + Isoproturon with line sowing gave up marking weed control due its synergism effect on weeds and crop got an opportunity for maximum growth and development.

Table-2.Fresh Weed biomass g m^2 of application of herbicide treatment

Treatments	Sowing Method		Means
	Line Sowing	Broad Casting	
Pendimethaline	567.13 g	614.83 e	590.98 c
Bromoxynil MCPA	629.13 d	676.97 c	653.05 b
Isoproturon	549.67 h	597.17 f	573.42 d
Pendimethaline+ Bromoxynil MCPA	371.13 n	417.97 k	394.55 g
Pendimethaline+ Isoproturon	393.13 m	441.13 j	417.13 f
Isoproturon+ Bromoxynil + MCPA	414.67 l	461.67 i	438.1
Weedy check	695.13 b	743.13 a	719.13 a
Means	517.14 b	564.70 a	

Dry weed biomass (kg m^2)

Tabulated data of dry weed biomass (kg) was found significantly different (Table-3). The treatments, sowing methods and their interaction had significant effects on weed dry biomass. Firstly, the concern to applied treatments (sub plots) indicated that the minimum dry weed biomass (250.885 and 275.79 kg) were noted for Pendimethaline + Bromoxnil MCPA followed by Pendimethaline + Isoproturon. However, the maximum dry weed biomass (349.79 and 324.93 kg) was observed for weedy check plot and then Bromoxnil MCPA. The reason may be due to the good control capacity of fresh weed biomass and density of weed in wheat crop field that could directly decrease the dry biomass of weeds. Secondly, mean data of sowing methods (main plots) showed the lowest fresh weed biomass (273.14 kg) that were sown through line sowing. Although, highest fresh weed biomass (320.15 kg) were recorded for broadcasting method. The growing of

wheat crop in line sowing is suitable to reduce the biomass as compare to broadcasting where weed population and dry weed biomass was high that has affected the yield of crop due to high competition. These finding are supported by Gul *et al*., (2002) who stated the wheat crop in line sowing inhibits the weed density and reduce the biomass and increased the crop development and production. Lastly, the dry weed biomass as effected by the interactions (treatments and sowing method) signified that the lowermost weed dry biomass (228.27and 252.33kg) were calculated for Pendimethaline + Bromoxnil MCPA× line sowing followed by Pendimethaline + Isoproturon × line sowing. Furthermore, highest weed dry biomass (373.60 and 348.60 kg) was noted for weedy check × broadcasting which was kept undisturbed and then Bromoxnil MCPA × broadcasting. The synergetic effects of Pendimethaline + Bromoxnil MCPA and Pendimethaline + Isoproturon with line sowing gave outmost reduction of weed that could directly decreased the dry biomass of weed and crop got an opportunity for maximum growth.

Table-3.Dry Weed biomass after application of herbicide treatment

Treatments	**Sowing Method**		**Means**
	Line Sowing	**Broad Casting**	
Pendimethaline	276.50 i	324.60 d	300.55 c
Bromoxynil MCPA	301.27 g	348.60 b	324.93 b
Isoproturon	268.17 k	314.33 e	291.25 d
Pendimethaline+ Bromoxynil MCPA	228.27 n	273.50 j	250.88 g
Pendimethaline+ Isoproturon	252.33 m	299.60 h	275.97 f
Isoproturon+ Bromoxynil+ MCPA	259.10 l	306.83 f	282.97 e
Weedy check	326.33 c	373.60 a	349.97 a
Means	273.14 b	320.15 a	

Number of grains spike^{-1}

Analysis of data of number of grains spike^{-1} as affected by different treatments and sowing methods, indicated in the table-4. The overall effects of treatments application, sowing methods and also their interaction had significant effects on number of grains spike^{-1}. Initially, the number of grains spike^{-1} as affected by treatments (sub plots) application showed the highest number of grains (58.83spike^{-1}) were noticed for Pendime bthaline + Bromoxnil MCPA. Whilst, the lowest number of grains (41.16 spike^{-1}) were noted for weedy check. Different herbicides had significant effects on weeds management in wheat crop. Secondly, as regards to grains spike^{-1} as affected by sowing method (main plots) had differences, the highest numbers of grains (55.19spike^{-1}) were observed for line sowing method. Although least number of grains spike^{-1} (51. 76) were documented for broadcasting method. Reason may be that, line sowing enhanced the competition and crop yield as compare to broadcasting. Finally, the interactive effects of treatments and sowing method enhanced the grains spike^{-1}showed the maximum numbers of grains (60.00spike^{-1}) were investigated for Pendimethaline + Bromoxnil MCPA× broadcasting. However, the lowermost grains (39.66spike^{-1}) were observed for weedy check × line sowing which was kept undisturbed. Our outcomes are in line with and Khalil *et al.,* (2000), as they studied wheat sowing methods and herbicides application to achieve good yield.

Table-4. Number of grain spike of application of herbicide treatment

Treatments	Sowing Method		Means
	Line Sowing	Broad Casting	
Pendimethaline	56.66 bcde	51.66 gh	54.16 cd
Bromoxynil MCPA	55.33 cdef	50.66 h	53.00 d
Isoproturon	56.00 bcdef	53.66 fg	54.83 bcd
Pendimethaline+ Bromoxynil MCPA	60.00 a	57.66 abc	58.83 a
Pendimethaline+ Isoproturon	58.66 ab	54.66 def	56.66 b
Isoproturon+ Bromoxynil+ MCPA	57.00 bcd	54.33 efg	55.66 bc
Weedy check	42.66 i	39.66 j	41.16 e
Means	55.19 a	51.76 b	

1000-grain weight (g)

Statistically analysis of mean data of 1000-grains weight (g) as affected by treatments and sowing methods had significant differences (Table-5). The individual effects of treatments and their interaction with sowing methods are highly significant whereas, the individual effect of sowing methods were non-significant. The treatments (sun plots) applications showed that the maximum 1000-grain weight (39.70 g) were observed for Pendimethaline + Bromoxnil MCPA. Though, the minimum 1000-grain weights (32.74 g) were noted for weedy check. The synergetic effects of tank mix herbicide are comparatively more due to the management of both grassy and broad leaf weed in wheat field, that could enhanced the crop yield and production. Similarly, about the sowing methods (sub plots) effects on 1000-grains weight (g) showed that the outmost1000-grain weight (37.31g) were noted for sown by line sowing. However, the least 1000-grain weight (35.35 g) was observed for broadcasting method. In cropping geometry, line sowing is suitable for weed management, which could improve 1000-grains weight as well the crop yield and development. Furthermore, the interactive effects on the 1000-grains weight showed that the highest 1000-grains weight (40.46 g) were observed for Pendimethaline + Bromoxnil MCPA × line sowing. While, the lowest 1000-grains weight (31.76 g) were investigated for weedy check plots × broadcasting method. Analogous results were also noted by Tanveer *et al.,* (1999) who discovered that the herbicides were exceptionally better for controlling weeds and provided better yield comparatively.

Table- 5. 1000-grain weight (g) of application of herbicide treatment

Treatments	Sowing Method		Means
	Line Sowing	Broad Casting	
Pendimethaline	36.56 bcdef	34.53 defg	35.55 cd
Bromoxynil MCPA	35.30 cdefg	33.00 fg	34.15 de
Isoproturon	37.83 abcd	35.66 bcdef	36.75 bc
Pendimethaline+ Bromoxynil MCPA	40.46 a	38.93 abc	39.70 a
Pendimethaline+ Isoproturon	39.33ab	37.56 abcde	38.45 ab
Isoproturon+ Bromoxynil MCPA	38.10 abcd	36.03 bcdef	36.75 bc
Weedy check	33.70 efg	31.76 g	32.74 e
Means	37.31	35.35	

Biological yield (kg ha^{-1})

Statistical analysis of the data of wheat biological yield (kg ha^{-1}) as effected by treatments application and sowing methods are presented in table-06. The treatments application, sowing methods and their interaction had significant effects on biological yield (kg ha^{-1}). Regardinng treatments application (sub plots) reduce the wheat biological yield showed that the highest biological yield (20260 and 19229 kg ha^{-1}) were founded for Pendimethaline + Bromoxnil MCPA followed by Pendimethaline + Isoproturon. Although, the lowermost biological yield (10668 and 14763 kg ha^{-1}) were noticed for weedy check and then bromoxnil MCPA plot. These findings are supported by Pandey *et al.* (2006) and Marwat *et al*. (2005), they revealed that distinctive herbicides had diminished the weeds and improved the grain and straw product of wheat above the control plots. Shah and Habibullah (2005) reported that the effective weeds control in crops enhanced the biological yields of the crops.

Table-06. Biological yield (kg ha^{-1}) of application of herbicide treatment

Treatments	Sowing Method		Means
	Line Sowing	Broad Casting	
Pendimethaline	16426 g	15150 h	15788 e
Bromoxynil MCPA	15318 h	14207 i	14763 f
Isoproturon	18427 d	16977 f	17702 d
Pendimethaline+Bromoxynil MCPA	22072 a	18448 d	20260 a
Pendimethaline+ Isoproturon	21148 b	17310 e	19229 b
Isoproturon+BromoxynilMCPA	20589 c	17065 f	18827 b
Weedy check	11090 j	10246 k	10668 g
Means	17867 a	15629 b	

Grain yield (kg ha^{-1})

Analysis of variance of the mean data of wheat grain yield (kg ha^{-1}) as affected by various treatments and sowing methods is presented in the table-07. The different treatments, sowing methods and their interactions had significant effects on grain yield (kg ha^{-1}). Regarding treatments application (sub plots) effects on grain yield (kg ha^{-1}) indicated that the highest grain yield (4857 and 4809.5 kg ha^{-1}) were observed for Pendimethaline + Bromoxnil MCPA and Pendimethaline + Isoproturon. While, lowest grain yield (2164.5 and 4078 kg ha^{-1}) were recorded in the weedy check followed by Bromoxnil MCPA. The combine effects on herbicides are remarkable due to synergic approach against weed and gave chance to maximized the wheat grains yield. Above information, regarding sowing method and herbicidal treatments were factually non-critical while the distinctions among the herbicides were measurably noteworthy. According to Arif *et al.,* (2004) herbicides have good effects on grain yield of wheat. Also with Tunio *et al.* (2004) who restated the effectiveness of herbicide in raising the grain yield of wheat.

Table 07. Grain yield (kg ha^{-1}) of application of herbicide treatment.

Treatments	Sowing Method		Means
	Line Sowing	**Broad Casting**	
Pendimethaline	4148.7 e	4144.0 e	4146.3 e
Bromoxynil MCPA	4101.0 ef	4056.3 f	4078.7 f
Isoproturon	4376.7 cd	4325.0 d	4350.8 d
Pendimethaline+ Bromoxynil MCPA	4859.0 a	4855.0 a	4857.0 a
Pendimethaline+ Isoproturon	4840.3 a	4778.7 a	4809.5 b
Isoproturon+ Bromoxynil MCPA	4492.3 b	4337.3 b	4464.8 c
Weedy check	2208.0 g	2121.0 h	2164.5 g
Means	4146.6 a	4102.5 b	

CONCLUSIONS

- The herbicide mixtures controlled mixed stands of broadleaf and grassy weeds with a consequent increase in grain yield.
- In case of sowing methods, line sowing decreases the weeds competition and increased the crop yield.
- The line sowing methods and herbicides combination (Pendimethaline + Bromoxynil and MCPA) practices giving outmost weed control as results make a chance to get highest wheat crop yields.
- Line sowing practices should be adopt for maximum weed control and reached up to mark yield of wheat.
- The herbicides mixture; Pendimethaline + Bromoxynil + MCPA combination is recommended for better weed management as well as crop yield.

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