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EFFECTS OF PLANTING METHODS AND TANK MIXED HERBICIDES ON CONTROLLING GRASSY AND BROADLEAF WEEDS AND THEIR EFFECT ON WHEAT *CV.* FAKHR-E-SARHAD

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ABSTRACT

A field experiment was conducted at Agricultural Research Institute, Tarnab Peshawar, Pakistan during Rabi 2001-2002 by planting wheat variety Fakhr-e-Sarhad, to investigate the response of planting methods and tank mixed herbicides. The experiment was laid out using a split plot arrangement, in randomized complete block design with three replications. Methods of planting were assigned to the main plots, while tank mixed herbicdes were kept in the sub-plots. The sub-plot size measured 4.5 X 4.5 m^2. Row to row distance was kept at 30 cm. Data were recorded on weed density m^{-2}, plant height (cm), spike length (cm), Number of spikes m^{-2}, Number of grains $spike^{-1}$, 1000 grain weight (g), biological yield (kg ha^{-1}), and grain yield (kg ha^{-1}). The weeds infesting the experiment were 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 data for individual traits were subjected to the ANOVA technique and significant means were separated by the LSD test. The analysis of the data showed that methods of sowing were statistically significant for plant height, No. of grains $spike^{-1}$, 1000-grain weight and biological yield. The herbicides were statistically significant for all the parameters investigated except No. of grains $spike^{-1}$, while the interaction of methods of planting with herbicides could not reach the level of significance in any of the traits examined. Among the methods of planting, line sowing was the best followed by line + broadcast sowing. The herbicide mixtures controlled mixed stands of broadleaf and grassy weeds to the tune of 65 to 74% with a consequent increase in grain yield from 58-107%. Buctril-M + Topik 15 WP, 2,4-D + Puma Super 75 EW and Topik 15 WP were segregated as the top scoring applications by increasing yield to the extent of 107, 104 and 101 %, respectively over the weedy check.

Key words: Planting/sowing methods herbicides wheat weed density grain yield

INTRODUCTION

Wheat (*Triticum aestivum L.*) belongs to the family Poaceae and is an annual self-pollinated, photoperiodically long day grass. Like other grasses wheat produces tillers depending upon soil fertility and micro- and macro-environment. Wheat is the most important staple food crop for the whole world. Its cultivation is simple and adaptable to a varied soil and climatic conditions. It is also known as the king of cereals. Besides food, wheat is used for livestock and poultry feeds. A large population of the world consumes wheat in a number of ways. Wheat culture both in NWFP, as well as in the whole country is the backbone of the whole agricultural system. In Pakistan, wheat was grown on an area of 8.46 million hectares with a grain production of 21.07 million tons, during 1999-2000. The mean country and provincial productions are limited to 2491 kg and 1324 kg ha^{-1}, respectively (Anonymous, 2000). During the recent years wheat production has exceeded the requirement of the nation and subsequently the nation has entered into the international wheat export trade. The factors responsible for luxuriant growth and production probably have been the timely availability of fertilizers, higher

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support prices of wheat and accelerated use of herbicides like Puma super and Topic by the growers The tempo however, needs to be sustained rather further accelerated, as still there exists a gap between the actual and potential yield of the crop at the farmers' fields. There are several reasons for this gap but the worst one is weed competition with the wheat crop in the field. The weeds use the soil fertility, available moisture, solar radiation and space with crop plants and result in yield reduction Moreover, the wheat grains contaminated with weed seeds fetch lower prices. As, the nation has entered the international export market, the production of cleaner wheat grains is essential for competition in the international trade. Pervaiz and Quazi (1992) have reported nearly 17.25 % losses caused to the wheat crop by weeds. The losses on annual basis amount to more than Rs. 28 billion at the national level and Rs. 2.00 billion in NWFP (Hassan and Marwat, 2001).

The weeds competitive with wheat crop in NWFP include *Avena fatua, Phalaris minor Anagallis avensis, Poa annua, Cirsium arvense, Convolvulus arvensis, Ammi visnaga, Chenopodium album, Fumaria polymorpha, Carthamus oxycantha, Euphorbia helioscopia, Medicago denticulata, Melilotus indica, Silybum marianum, Galium aparine* and *Rumex crispus.*

Wheat can be sown by different methods viz., drilling in lines, cross sowing or broadcasting. Each method of planting has a varying impact on weed competition. For wheat cultivation the best method is line and line + broadcast sowing (Gogoi and Kalita, 1995; Code and Donaldson, 1996), because of equidistant spacing of wheat, the wheat is better competitive with weeds. Weed control has been practiced since the time immemorial by manual labour or animal drawn implements, but these practices were laborious, tiresome and expensive due to increasing cost of labour. The growing mechanization of farm operations and ever increasing labour wages have stimulated interest in the use of chemical weed control. Chemical weed control is the easiest and most successful alternative method. Although different reports are available on the efficacy of different herbicides in wheat (Mohibullah and Ali , 1974; Gill and Walia, 1979; Praczyk, et al. 1995; Balyan et al., 1983; Porwal and Gupta (1987); Azad et al. 1997; Khan et al., 1999; Khan et al., 2001; Khan et al., 2002; Hashim et al., 2002; Qureshi et al. 2002), the herbicide use in Pakistan is not widely practiced as in the agriculturally advanced nations. The interest around the testing of graminicides (Walia et al., 1998; Ormeno and Diaz, 1998; Brar et al., 1999a; Brar et al. 1999b) indicates the problems posed by grasses. Tank mixing of herbicides is practiced for attaining synergism but, antagonism is also not uncommon in such a mixing (Williams, 1984; Deschamps, et al., 1990; Augero-Alverdo and Appleby, 1991; Augero-Alverdo, et al., 1991; Pandey and Singh, 1994; Brar et al., 1999b). Whereas, the studies of Panwar et al. (1996) and Khan et al. (2002) showed synergistic response on combined use of herbicides

The instant studies were undertaken to evaluate the efficacy of different herbicides alone and in mixture on dynamics of weeds in wheat planted with different methods with these objectives a) to find out the most economical tank mixture of herbicides for the control of weeds in wheat crop b) to figure out the most suitable planting method for wheat cultivation and c) to evaluate the response of wheat to different planting methods and tank mixture of herbicides.

METHODS AND MATERIALS

An experiment was conducted at Agricultural Research Institute, Tarnab, Peshawar during Rabi 2001-2002 to investigate the efficacy of some herbicide mixtures on grassy and broadleaf weeds and their consequent effect on wheat crop. The experiment was laid out in a split plot design with three replications. In a well-prepared soil, the basal dose of NPK was applied. All the phosphorous and potash were applied at the time of planting while, nitrogen was applied in two split doses. First half with the first irrigation and the remaining half at the early boot leaf stage. Methods of sowing (broadcast, line sowing and line + Broadcast) were assigned to the main plots, while ten herbicides detailed below (Table-1) were kept in the subplots. Each sub-plot size measured 4.5 x 1.5 m^2. Row to row distance was kept at 30 cm. Wheat variety Fakhre-Sarhad was sown on the 11th November, 2001 at the rate of 100 kg ha^{-1} with broad cost and seed drill and broadcast + drill. The herbicides were applied with a knapsack sprayer during mid-January 2002, after first irrigation, when the soil was in an adequate

moisture status. To spray the herbicides successfully all the precautionary measures were adopted so as to avoid any danger of physical exposure to the herbicides. During the course of studies the data were recorded on Weed Density (m^{-2}), Plant height (cm), Spike Length (cm), No. of Spikes m^{-2}, No. of Grains $spike^{-1}$, 1000 grain weight (g), Biological yield (kg ha^{-1}) and Grain yield (kg ha^{-1}). Standard procedures were adopted for recording the data on all above traits.

The data recorded for each trait were individually subjected to the ANOVA technique by using MSTATC Computer software and means were separated by using Fisher's protected LSD test (Steel and Torrie, 1980).

Table 1. Detail of the tank mixed herbicides assigned to the sub-plots.

S. No	Herbicides Mixtures (Trade name)	Common Name	Dose (kg a.i. ha^{-1})
i	2,4-D+ Puma Super 75 EW	2,4-D fenoxaprop-p-ethyl	0.90 + 0.94
ii	2,4-D + Topik 15 WP	2,4 –D+ clodinafop	0.90 + 0.04
iii	2,4-D + Isoproturan 50 WP	2,4-D + isoproturon	0.90 + 0.63
iv	Buctril-M40 EC+Puma Super 75 EW	(bromoxynil + MCPA) + fenoxaprop-p-ethyl	0.70 + 0.94
V	Buctril-M 40 EC + Topik 15 WP	(bromoxynil + MCPA) + isoproturon	0.70 + 0.04
vi	Buctril-M 40 EC +Isoproturon 50 WP	(bromoxynil + MCPA) + isoproturon	0.70 + 0.63
vii	Logran Extra 64 WG + Puma Super 75 EW	(tr asulfuron+ terbutryn)+ fenoxaprop-p-ethyl	0.16 + 0.94
viii	Logran Extra 64 WG + Topik 15 WP	(triasulfuron+ terbutryn)+ clodinafop	0.16 + 0.04
ix	Logran Extra 64 WG + Isoproturon 50 WP	(triasulfuron + terbutryn)+ isoproturon	0.16 + 0.63
X	Weedy check (no weeding)	-	-

RESULTS AND DISCUSSION

An experiment comprising method of sowing and herbicides on wheat was carried out at Agricultural Research Institute, Tarnab, Peshawar. Data were recorded on weed dynamics and some morphological and agronomic traits of wheat. The data are presented as under:

Weed density m^{-2}

The analysis of variance showed that method of planting and interaction of method of planting with herbicides were non-significant statistically while, the herbicidal applications were evaluated as significant statistically. It is evident from the data in Table-2 that almost similar weed density m^{-2} was recorded in all methods of planting. However, the highest weed density was recorded in the broadcast sowing (37.1) as compared to line (30.467) or line + broadcast sowing (31.700). All herbicidal combinations although were non-significant among themselves, had a lower density of weeds m^{-2} as compared to the weedy check (88.889). Among the herbicides numerically lowest weeds (23.333) were recorded in Buctri–M + Isoproturon. The interaction of the method of planting with herbicides was non-significant statistically. However, the lowest weed density (20.0) was observed in line sowing treated with Buctril–M + Topik. The treatments involving line sowing in general, had the lowest infestation as compared to the interactions in line + broadcast or broadcast sowing. The highest weed density (104.667) was recorded in the weedy check under broadcast sowing (Table–2). These results are in conformity with Panwar et al. 1995, Pandey and Singh 1994, Kha et al. (1999), Khan et al. (2002) and Khan et al. (2003) who reported that application of the tank mixed herbicides reduced broad and narrow leaf weeds to a varying degree sometimes approaching 100% . Our findings are however, contrary to the work reported by Williams 1984, Deschamps, et al., 1990, Augero-Alverdo and Appleby, 1991, and Augero-Alverdo, et al. 1991.

The variability in findings could be attributed to the different herbicidal combinations tested by those researchers

Table 2. Effect of method of planting and herbicides on weed density (m^{-2}) in Wheat.

Herbicidal combination	Line sowing	Line + Broadcast	Broadcast	Herb cide Means
2 4-D + Puma Super	22.333	25.667	31 667	26 556 A*
2 4-D + Topic	26.000	24 667	31.000	27 222 A
2.4-D + Isoproturon	27.000	28.333	34.667	30.000 A
Buctril-M + Puma Super	29 000	30.000	34.333	31.111 A
Buctril-M + Topik	20.000	24 667	29 000	24 556 A
Buctril-M+ Isoproturon	25 667	22 333	22 000	23 333 A
Logran Extra+ Puma Super	25.000	28.667	33.667	29 111 A
Logran Extra + Topik	24.667	25 667	24.000	24.778 A
Logran Extra + Isoproturon	23.000	27 000	26.000	25.333 A
Weedy check	82 000	80 000	104 667	88 889 B
Mean	30 467	31.700	37.100	

LSD values for herbicides = 11.26

* The means sharing a letter in common do not differ significantly by LSD test at 5% probability level

Plant height (cm)

The analysis of variance showed that method of planting and herbicidal applications were statistically significant, while the interaction between method of planting and herbicides was evaluated as non significant statistically. The perusal of data in Table–3 exhibits that Line + Broadcast and Broadcast Sowing were statistically at par with each other, but surpassed the Line Sowing. More plant height (102 cm each) was recorded in Line + Broadcast and Broadcast Sowings. All herbicides although non-significant among themselves had a more plant height as compared to the weedy check (78 cm). Almost all the herbicides gave the equal plant height (103 cm) numerically except Logran Extra + Topik and Logran Extra + Isoprturon (102 cm), which had slightly lower plant height. Earlier workers like Ahmed et al, 1999 have also found that herbicides do not effect plant height and concluded that trait under reference is strictly under genetic control. The difference in findings can be attributed to the different genetic material used and a variance in environmental conditions. The interaction of method of planting with herbicides although non-significant statistically exhibits that the plant height of the treatments involving Broadcast Sowing was generally taller (105 cm) than the other planting methods. The minimum plant height (75 cm) was observed in the weedy check under the Line sowing (Table–3). These results are corroborated with the conclusions of Gogoi and Kalita, 1995

Spike length (cm)

The analysis of variance showed that methods of sowing and interaction of method of planting with herbicides were statistically non significant, while the herbicidal applications were detected as significant. It is evident from the data in Table–4 that almost similar spike length was recorded in all methods of planting. However, the longest spikes (10 cm) were recorded in Line and Line + Broadcast sowing. All tank mixed herbicides although non significant among themselves had a more spike length (10 cm) as compared to the weedy check (9 cm). The interaction of method of planting with herbicides was non-significant statistically, yet the highest spike length (11 cm) was observed in Line + Broadcast Sowing treated with 2, 4-D + Puma Super, 2, 4-D + Topik, Logran Extra + Puma Super, Logran Extra + Topik and in Broadcast 2, 4-D + Puma Super (Table-4). These results are in agreement with the work of Ahmed et al, 1999, who reported that spike length is significantly affected by herbicidal applications.

Table 3. Effect of method of planting and herbicides on plant height (cm) in wheat.

Herbicidal Combination	Line sowing	Line + Broadcast	Broadcast	Mean
2,4-D + Puma Super	100	103	105	103 A *
2,4-D + Topic	101	103	105	103 A
2,4-D + Isoproturon	100	104	104	103 A
Buctril-M + Puma Super	100	104	105	103 A
Buctril-M + Topic	100	104	104	103 A
Buctril-M+ Isoproturon	101	104	104	103 A
Logran Extra + Puma Super	100	104	104	103 A
Logran Extra + Topic	99	103	103	102 A
Logran Extra + Isoproturon	98	104	104	102 A
Weedy check	75	81	79	78 B
Mean	98 B	102 A	102 A	

$LSD_{0.05}$ for sowing methods = 3.348

$LSD_{0.05}$ for herbicides = 2.671

* The means sharing a letter in common in their respective category do not differ significantly by LSD test at 5% probability level.

Table 4. Effect of method of planting and herbicides on spike length (cm) in wheat.

Herbicidal Combination	Line sowing	Line + Broadcast	Broadcast	Mean
2,4-D + Puma Super	10	11	11	10 A*
2,4-D + Topic	10	11	9	10 A
2,4-D + Isoproturon	10	10	10	10 A
Buctril-M + Puma Super	10	10	9	10 A
Buctril-M + Topic	10	10	10	10 A
Buctril-M+ Isoproturon	10	10	10	10 A
Logran Extra + Puma Super	10	11	9	10 A
Logran Extra + Topic	9	11	9	10 A
Logran Extra + Isoproturon	9	10	9	10 A
Weedy Check	9	9	9	9 B
Mean	10	10	9	

$LSD_{0.05}$ for herbicides = 0.9822

*The means sharing a letter in common do not differ significantly by LSD test at 5% probability level.

No. of spikes m^{-2}

The No. of spikes per unit area is the most important trait contributing to the grain yield in wheat The data on No. of spikes per m^2 are presented in (Table–5). The statistical analysis of the data indicated that methods of sowing and interaction of method of sowing with herbicides was statistically non significant while, the differences among the herbicides were detected as significant. The data in Table–5 show that almost similar spikes m^{-2} were recorded in all methods of sowing. However, the highest spikes m^{-2} (276.47) were observed in line sowing as compared to Line + Broadcast (269.53) or Broadcast (246.73) sowing. Among the herbicides the highest No. of spikes m^{-2} were recorded in 2, 4-D + Topik (276.67) which however were statistically at par with all other herbicidal applications but statistically higher than the weedy check (199.78) [Table –5]. The interaction of the method of planting with the herbicides although non- significant statistically exhibited that the spikes m^{-2} of the treatments involving Line sowing were generally higher than the other planting methods. Line sowing treated with Buctril–M+Topik (293.00) gave the maximum No. of spikes m^{-2} (Table–5) .

Table 5. Effect of methods of planting and herbicides on No. of Spikes m^{-2} in wheat.

Herbicidal Combination	Line sowing	Line + Broadcast	Broadcast	Mean
2,4-D + Puma Super	275.00	277.00	233.33	261.78 A*
2,4-D + Topic	288.67	281.67	259.67	276.67 A
2,4-D + Isoproturon	278.33	279.33	266.67	274.78 A
Buctril-M+ Puma Super	286.00	263.00	263.00	270.67 A
Buctril-M + Topic	293.00	270.67	262.67	275.44 A
Buctril-M+ Isoproturon	280.00	276.33	272.67	276.33 A
Logran Extra + Puma Super	289.67	283.33	237.33	270.11 A
Logran Extra + Topic	288.00	280.67	230.33	266.33 A
Logran Extra + Isoproturon	280.33	275.67	255.67	270.56 A
Weedy Check	205.67	207.67	186.00	199.78 B
Mean	276.47	269.53	246.73	

$LSD_{0.05}$ for herbicides = 39.46

*The means sharing a letter in common do not differ significantly by LSD test at 5% probability level.

Number of grains spike^{-1}

Number of grains spike^{-1} is another important component of yield. Change in number of grains spike^{-1} drastically influences the final yield. The analysis of data showed that the variable method of sowing was evaluated as significant, while the herbicides and interaction of methods of planting with herbicides were statistically non significant. The data in Table–6 exhibits that higher grains spike^{-1} (53.213) were recorded in line sowing. However, it was statistically at par with line + broadcast sowing (50.197) but higher than broadcast sowing (44.2). The herbicidal treatments were statistically non significant, but numerically the highest No. of grains (52.41) were observed in 2,4-D + Topik. Minimum grains (45.00) were recorded in weedy check (Table 6). The interaction of method of planting with herbicides although non significant statistically, exhibited higher grains spike^{-1} (59.569) in the line sowing treated with 2, 4-D+Topik. The lowest grains spike^{-1} (42.333) were recorded in the 2,4-D+Isoproturon under the broadcast planted treatment. These results are corroborated with the results of Balyan et al., 1983, Khan et al, 2001, Khan et al., 2002 and Khan et al, 2003. who concluded that herbicidal applications produce more grains spike^{-1} than the untreated control.

1000-grain weight (g)

The analysis of data indicated that the methods of planting and herbicides were significant statistically, while the interaction of method of planting with herbicides was statistically non significant. The maximum1000 grain weight (39 g) was recorded in line + broadcast sowing, but it was statistically higher than the line and broadcast sowing (37 g) [Table 7]. Among the herbicides, the maximum 1000 grain weight was recorded in Buctril–M+Topik and Logran Extra+ Puma Super (39 g) each which however were statistically at par with all other herbicidal applications, but statistically higher than the weedy check (30 g). The interaction of method of planting with herbicides although non significant statistically, showed that the treatments involving line and line + broadcast sowing generally had bolder grain than broadcast sowing. Line sowing treated with Buctril–M+Puma Super (40 g each) had the highest 1000 grains weight (Table –7), while broadcast and line sowings under the weedy check (28 g each) possessed the smallest kernel size. Similar results were also reported by Tanveer et al., 1999, Balyan et al., 1996 and Samunder et al., 1994. who concluded that the herbicides were very effective for weed control and also gave best crop yield.

Table 6. Effect of method of planting and herbicides on No. of grains Spike^{-1} in wheat.

Herbicidal Combinations	Line sowing	Line + Broadcast	Broadcast	Mean
2,4-D + Puma Super	52.100	52.00	42.667	48.92
2,4-D + Topic	59.569	50.667	47.000	52.41
2,4-D + Isoproturon	50.767	50.633	42.333	47.81
Buctril-M + Puma Super	57.800	49.667	48.333	50.93
Buctril-M + Topic	51.433	54.133	44.333	49.97
Buctril-M+ Isoproturon	54.867	50.000	43.333	49.29
Logran Extra + Puma super	56.467	48.033	45 333	49.94
Logran Extra + Topic	57.133	51.800	43.000	50 64
Logran Extra+ Isoproturon	48.667	49 333	43.333	47 11
Weedy Check	46.333	46 000	42.667	45.00
Mean	53.213 A*	50.197 A	44.200 B	

$LSD_{0.05}$ for sowing methods = 4.618

*The means sharing a letter in common do not differ significantly by LSD test at 5% probability level.

Table 7. Effect of method of planting and herbicides on 1000 grain weight (g) in wheat.

Herbicidal Combinations	Line sowing	Line + Broadcast	Broadcast	Mean
2,4-D + Puma Super	38	39	38	38 A*
2,4-D + Topic 15 WP	39	39	37	38 A
2,4-D + Isoproturon	38	39	36	38 A
Buctril-M + Puma Super	40	39	37	38 A
Buctril-M + Topic	38	40	38	39 A
Buctril-M+ Isoproturon	39	39	37	38 A
Logran Extra+ Puma Super	38	39	39	39 A
Logran Extra+Topik 15 WP	38	40	37	38 A
Logran Extra+ Isoproturon	37	40	37	38 A
Weedy Check	28	33	28	30 B
Mean	37 B	39 A	37 B	

$LSD_{0.05}$ for sowing method = 1.62 $LSD_{0.05}$ for herbicides = 2.628

*The means sharing a letter in common in their respective category do not differ significantly by LSD test at 5% probability level.

Biological yield (kg ha^{-1})

The analysis of variance showed that method of planting and herbicidal applications were statistically significant, while the interaction of method of planting with herbicides was recorded as statistically non significant. The highest biological yield (17763 kg ha^{-1}) was recorded in Line sowing, while Line +Broadcast (16739) and Broadcast sowing (15970) were statistically at par with each other (Table –8). Among the herbicides, the highest biological yield (18793 kg ha^{-1}) was recorded in 2, 4-D + Puma Super. However, it was statistically at par with all other herbicidal applications except Logran Extra + Topik (15638 kg ha^{-1}). The lowest biological yield (10908 kg ha^{-1}) was observed in the weedy check. The interaction of method of planting with herbicides although non-significant statistically exhibits that the biological yield of the treatments involving Line sowing was generally higher than the other planting methods. Line sowing treated with 2,4-D + Puma super gave maximum biological yield (22222 kg ha^{-1}) than rest of the interactions. The minimum biological yield (10601 kg ha^{-1}) was recorded in weedy check under the Line + broadcast sowing. The herbicide 2,4-D + Puma super gave the excellent control of weeds hence consequently it increased the biological yield (Table-8). These results are in a greater agreements with the work of

Porwal and Gupta, 1987 and Brar et al., 1999b. They also reported that different herbicides reduced weed and increased grain and straw yield of wheat over the control plots.

Table 8. Effect of method of planting and herbicides on biological yield kg ha^{-1} in wheat.

Herbicidal Combinations	Line sowing	Line + Broadcast	Broadcast	Mean
2,4-D + Puma Super	22222	16872	17284	18793 A*
2,4-D + Topic 15 WP	18922	18930	16173	18008 AB
2,4-D + Isoproturon	19341	17284	18930	18518 AB
Buctril-M + Puma Super	18383	17697	15638	17239 AB
Buctril-M + Topic 15 WP	18107	16872	15220	16733 AB
Buctril-M+ Isoproturon	18930	15638	18107	17558 AB
Logran Extra+ Puma Super	16461	16872	17284	16872 AB
Logran Extra + Topic 15 WP	15638	17284	13992	15638 B
Logran Extra + Isoproturon	18107	19342	16461	17970 AB
Weedy Check	11523	10601	10601	10908 C
Mean	17763 A	16739 B	15970 B	

$LSD_{0.05}$ for sowing methods = 851
$LSD_{0.05}$ for herbicides = 2893
* The means sharing a letter in common in their respective category do not differ significantly by LSD test at 5% probability level.

Grain yield (kg ha^{-1})

The data showed that method of sowing and the interaction of method of sowing with herbicides were statistically non-significant while, the differences among the herbicides were detected as significant The perusal of data (Table 9) exhibited that almost similar grain yield was recorded in all methods of planting. However, the line + broadcast had a slightly higher yield (4142.78 kg ha^{-1}) as compared to line (4078.39) or broadcast sowing (4088.53). All the herbicides out yielded the weedy check. Among the herbicides the highest yield was recorded in Buctril-M + Topik (4771.06 kg ha^{-1}) However, it was statistically at par with all other herbicidal applications except Buctril-M + Isoprutron (3631.82 kg ha^{-1}), 2,4-D + Isoprturon (3775.64 kg ha^{-1}), and Buctril-M + Puma Super (4138.53 kg ha^{-1}). The herbicide Buctril-M + Isoprotran was in turn statistically comparable with Buctril-M + Puma Super (4138.53 kg ha^{-1}), Logran Extra + Topik (4378.86 kg ha^{-1}), Logran Extra + Isoprutron (4389.79 kg ha^{-1}) and Logran+Puma Super (4314.13 kg ha^{-1}) (Table 9). The herbicides Buctril-M+Topik gave an excellent control of weeds hence consequently increased the grain yield. The interaction of the method of planting with the herbicides although non-significant statistically exhibited that the yield of treatments involving line+broadcast sowing was generally higher than the planting with the other methods Line+Broadcast treated with 24-D+Puma Super out yielded (5115.23 kg ha^{-1}) the rest of the interactions. The lowest grain yield (2239.68 kg ha^{-1}) was recorded in the weedy check, under line sowing These findings are in a close conformity with Pandey and Singh 1994 Azad et al, 1997 and Samunder et al. 1994 who reported a differential response of various herbicides on the grain yield of wheat.

Table 9. Effect of method of planting and herbicides on grain yield (kg ha^{-1}) in wheat.

Herbicide Combination	Method of Sowing			
	Line sowing	Line + Broadcast	Broadcast	Mean
2,4-D + Puma Super	4395.06	5115.23	4568.07	4692.78A*
2,4-D + Topic 15 WP	4802.47	4691.36	4407.59	4633.81A
2,4-D + Isoproturon	3744.86	4084.13	3497.94	3775.64CD
Buctril-M + Puma Super	3781.89	3884.74	4748.97	4138.53BC
Buctril-M + Topic	4494.24	4979.42	4839.51	4771.06A
Buctril-M+ Isoproturon	3827.16	3223.46	3844.86	3631.82D
Logran Extra + Puma Super	4979.42	3859.67	4103.29	4314.13AB
Logran Extra + Topic 15 WP	4320.98	4456.57	4359.02	4378.86AB
Logran Extra + Isoproturon	4198.19	4855.97	4115.22	4389.79AB
Weedy Check	2239.68	2277.36	2400.82	2305.96 E
Mean	4078.39	4142.78	4088.53	

$LSD_{0.05}$ for treatment = 494.7

* The means sharing a letter in common do not differ significantly by LSD test at 5% probability level.

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