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YIELD OF WHEAT VARIETIES UNDER SOLID AND SKIP ROW GEOMETRIES

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ABSTRACT

The objectives of the study was to find out the performance of different wheat varieties sown under solid and skip row geometries. An experiment was carried out at New Development Form of KPK Agricultural University Peshawar, Pakistan during winter season of 2002-2003. The experimental setup was randomized complete block design (RCBD) with split plot arrangement having three replications. Sowing was done on 18th November, 2002. Row geometry was allotted to main plot and different wheat varieties were allotted to sub plots. The size of each sub plot was 2.4m by 5m. Six different wheat varieties (Bakhtawar-92, Fakhar-e-Sarhad, Ghaznavi-98, Nowshera-96, Chakwal, and Khyber-87) were planted in skip and solid row geometries randomly. In solid row geometry the row to row distance was 30 cm and in skip row geometry, pairs of row were 60 cm apart and within pairs the row to row distance was 30cm. The following parameters via emergence m^{-2}, days to anthesis, plant height, number of tillers m^{-2}, spike density m^{-2} were studied in the experiment. The solid row geometry reported better emergence, took more days to anthesis and gave higher spike density as compared to skip row geometry. Skip row geometry produced taller plants than solid row geometry. Performance of the two wheat varieties, Fakhar-e-Sarhad and Ghaznavi-98 was found appreciable than the other four varieties i.e., Bakhtawar-92, Nowshera-96, Chakwal, and Khyber-87.

Keyword: planting geometries skip row sowing, solid row sowing, wheat yield.

INTRODUCTION

Wheat the so called "King of Cereals" is the leading world food crop. It is grown world-wide as a temperate (rabi) crop. It exceeds all other crops both in areas and production. Hence it is a major commodity in world food trade. The acceptance of wheat as a basic food stuff led to its widespread dissemination as food aid to developing countries. In Pakistan wheat is the staple food crop, cultivated in both irrigated and rainfed areas of the country. Cereals are an important dietary source in the world, because they constitute the main protein and energy supply in the most countries (Bos *et al.,* 2005). Its straw (bhusa) is an important dry fodder for animals. It is also used for manufacturing various food products such as baking powder 27%, suji 18%, bran 15% and flour 45%.

Approximately one sixth of the total arable land in Pakistan is cultivated with wheat. It contributes 14.4% to value added in agriculture and 3% to GDP. It accounts for over 70% of the gross cereals and over 36% of the country's acreage is devoted to wheat cultivation. Over the past few decades, increased agricultural productivity occurred largely due to the deployment of high-yielding cultivars and increased fertilizer use.

Pakistan is the 4th largest producer of wheat in Asia and stands 11th in world production. The total area occupied by wheat in 2009-10 was 9.041 million hectares, which produced 23.86 million tons food grain, while in Khyber Pukhtunkhwa the total area occupied by wheat was 1.8 million hectares, which produced 1.21 million tons (MINFAL, 2009-2010).

Wheat also comes on the top due to its suitability for bread making followed by rye. The bread making quality is due to its gluten content which makes a cohesive network and entraps the CO_2 released in fermentation and enables a leavened drought to rise. Mature wheat grains contain 8-20% proteins, in which the major components are glutens, gliadins and glutenins, which contributed about 80-85% of total flour proteins, and these proteins are responsible for the rheological properties of wheat flours (Kuktaite, 2004).

Planting geometry is one of the factors that can be varied to change the microclimate inside canopy for better light and CO_2 utilization in an attempt to enhance crop productivity (Duncan, 2000).

Moreover, with skip row geometry it is possible to grow another crop between the strips and therefore production per unit area may be increased to face challenge of food storage. Planning geometry affect light penetration in plant canopies, plants per unit area and plant stand as well as micro environment in and around plant canopies. Skip or wider planting geometry makes application of herbicides and other fertilizer and intercultural practices for weed control easier as compare to solid planting geometry.

The present study was design to test the hypothesis of variations in yield of two planting geometries using six varieties of wheat.

MATERIALS AND METHODS

The experiment was conducted in 2002-2003 at Agriculture Research Farm of the KPK Agricultural

University Peshawar, Pakistan. The site of experiment is situated at 33^0 N latitude, 72^0 E longitudes and an altitude of 450m above sea level. Peshawar valley is situated about 1550 km north of the Indian Ocean and thus has a continental climate. The soil of the experimental site was silty clay loam, low in nitrogen (0.03-0.04 %), lower organic matter (0.8-0.9%), phosphorus concentration (6.57 mg kg^{-1}), exchangeable potassium (121 mg kg^{-1}) and alkaline in reaction with a pH of 8.0-8.2 (Amanullah *et al*., 2009).

The following two planting geometries and six wheat varieties were included in the experiment.

a) Row geometries

G_1 = solid row sowing
G_2 = skip row sowing

b) Varieties

V_1 = Bakhtawar-98
V_2 = Fakhar-e-sarhad
V_3 = Ghaznavi-98
V_4 = Nowshera-96
V_5 = Chakwal
V_6 = Khyber-87

The experiment was conducted using Randomized Complete Block Design with split plot arrangement and three replications. Row geometry was allotted to main plot and varieties were allotted to sub plot. Sub plot size was 2.4 m by 5 m, having eight rows 30 cm apart in solid sowing and three pairs or rows in skip row geometry. A basic dose of 120 kg N and 90 kg P per ha was given to wheat. The experiment was planted on 18^{th} of November, 2002. Sowing was done by dropping the seed in furrow drawn by hand hoe and then covering the seed. Data was collected on the following parameters.

For recording emergence m^{-2}, seedlings were counted in three randomly selected sampling units consisting of 1m long row in each sub plot. The mean of the three recorded values was used to calculate emergence per m^2. Days to anthesis was calculated from date of emergence to date of anthesis. Plant height was recorded by taking three representative plants in each sub plot and measuring the height from the soil level to the top of the plant with a measuring rod then taking the mean of the three values. Number of tillers m^{-2} data was recorded by counting total number of tillers per plant in an m^{-2} area. To record data on spike density m^{-2}, fertile spikes were counted in three randomly selected rows in each sub plot. From the mean of the three values of spike density m^{-2}, spikes m^{-2} was calculated.

RESULTS AND DISCUSSIONS

The reported observations of the research on emergence (number of plants m^{-2}) of wheat varieties as affected by row geometry is reported in Table-1. Statistical analysis of the data revealed that both the factors i.e., planting geometries and varieties had non significant effect on emergence m^{-2}. The probable reason might be due to the fact that as row space became wider the competition of wheat against weeds or other unwanted factors became weak and it resulted in low population of wheat in early growth stages. The observed results also reported a non significant association between the interactions of both the factors on emergence m^{-2}. This result is in conformity with those of (Cholick, 1978) who reported that with increased in row spacing of wheat, emergence of plants will decreased.

The recorded observations for tillers per m^2 also showed that the planting geometries and varieties had non significant effect on the concern parameter presented in Table-1. The reason for the observed result may be due to some climatic factors which lower the efficiency of the more tiller production. These results are in contrast with those of (Gyori, 2005), who reported that number of tillers increased with increased in row spacing. But (Felicio, 1991) showed similar results, that as row spacing increased, number of tillers decreased. Likewise the interaction of both the factors also showed non significant effect on tillers m^{-2}.

Data recorded on days to anthesis are presented in Table-1. Statistical analysis of the data showed that both the factor i.e., planting geometries and varieties had no significant effect on the number of days to anthesis. This result is in conformity with (Hassanain, 2001) who reported that with increased row spacing, days to anthesis decreased. Similarly the interaction of both the factors also reported non significant effect on days to anthesis.

The data concerning plant height are given in Table-1. It is obvious from the statistical analysis of the data that plating geometries and varieties had significant effects on plant height. It is evident from the data that tallest plants of 99cm were recorded in Fakhar-e-Sarhad with 60cm row spacing whereas smallest plant height of 85cm was recorded in Chakwal variety. The mean values of the planting geometries i.e., solid and skip row sowing showed that the skip row sowing produced taller plants of 94cm as compared to solid row sowing which produced 88cm tall plants. The convincing point for the concern result may due to the fact that there was less competition for the nutrient requirement of plants which compelled the plant to grow taller also the reason may be due to the genetic potential of the wheat varieties which produced taller plants. This result is similar to (Kler and Dains, 1992) who reported that as row spacing increased, plant height also increased. The results from the analyzed data reported that the interaction of both the factors i.e. planting geometries and wheat varieties showed non significant effect for plant height.

The data recorded on spike density per m^2 are presented in Table-1. The statistical analysis of the presented data showed that both the factors i.e., planting geometries and different wheat varieties had non significant effect on spike density per m^2. The probable reason may be due to that, in wider space between the rows there may be more chance for weed infestation which resulted low tiller production and ultimately there was low spike density per m^2. This result is in contrast with the

results of (Zeidan, 2003), who reported that spike density per m^2 increased with increased in row spacing. The presented data also showed that the interaction of both the factors had non significant effect on spike density per m^2.

Table-1. Influence of solid and skip row geometries on yield of different wheat varieties.

Treatments	Emergence m^{-2}	Number of f tillers m^{-2}	Days to anthesis	Plant height (cm)	Spike density m^{-2}
Row geometry (Factor A)					
Solid	186.5	309.6	119.6	88.0	182.9
Skip	154.0	309.4	119.0	94.0	151.0
LSD	ns	ns	ns	**	ns
Varieties (Factor B)					
Bakhtawar-92	170.6	341.3	120.0	81.6	182.3
Fakhar-e-Sarhad	191.2	382.0	118.6	95.6	230.3
Ghaznav-98	181.4	383.6	119.3	91.6	185.6
Nowshera-96	177.5	354.0	121.1	84.0	173.3
Chakwal	190.1	381.3	120.3	83.0	158.3
Khyber-87	198.3	397.3	118.3	90.6	167.6
LSD	ns	ns	ns	**	ns
Interaction (AxB)					
Bakhawar X SoRG	171.8	340.9	122	82.4	181.9
Fakhar-e-Sarhad X SoRG	190	381.8	119.9	96.2	231.9
Ghaznav-98 X SoRG	182.1	382.6	120.2	92.3	186.2
Nowshera-96 X SoRG	178.3	355.6	121.9	85.2	174.6
Chakwal X SoRG	192.0	382	121.8	84.3	157.9
Khyber-87 X SoRG	197.6	398.8	119.9	91.7	168.3
Bakhawar X SkRG	178.6	357.6	117.9	96.0	163.3
Fakhar-e-Sarhad X SkRG	162.6	326.6	122.0	102.3	190.0
Ghaznav-98 X SkRG	153.6	308.0	116.9	99.3	159.0
Nowshera-96 X SkRG	134.0	270.0	119.3	93.0	149.0
Chakwal X SkRG	155.0	313.0	117.6	86.3	109.0
Khyber-87 X SkRG	140.6	281.3	120.5	89.0	135.3
LSD	ns	ns	ns	ns	ns

Mean of the same categories followed by different letter (s) in common or not significantly different from one another at $P \geq 0.05$
SoRG = Solid Row Geometry
SkRG = Skip Row Geometry
LSD = Least Significant Different
ns = Non Significant

CONCLUSION AND RECOMMENDATIONS

It was concluded from the experiment that performance of the two wheat varieties that are Fakhar-e-Sarhad and Ghaznavi-98 was better as compared to other four varieties of wheat and is therefore recommended for sowing at Peshawar valley. Local farmer are also recommended to practice solid row sowing for appreciable yield of wheat.

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