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PERFORMANCE OF WHEAT VARIETIES SOWN UNDER SOLID AND SKIP ROW GEOMETRY

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ABSTRACT

A study was conducted to find out the performance of different wheat varieties sown under solid and skip row geometries. The experiment was carried out at New Developmental Farm, Khyber Pakhtunkhwa Agricultural University, Peshawar, Pakistan during winter season of 2002-2003. A randomized complete block design (RCBD) with split plot arrangements having three replications was used. Sowing was done on 18th November, 2002. Row geometry was allotted to main plot and varieties were allotted to sub plots. The size of sub plot was 2.4m x 5m. Different wheat varieties (Bakhtawar-92, Fakhar-e-Sarhad, Ghaznavi-98, Nowshera-96, Chakwal, Khyber-87) were randomly planted in skip and solid row geometries. In solid row geometry the row to row distance was 30 cm and in skip row geometry, pairs of rows were 60 cm apart and within pairs the row to row distance was 30cm. Parameters such as number of grain spike^{-1}, kernel weight, grain yield, biological yield and harvest index were studied in the experiment. Skip row geometry produced more grain spike^{-1}, heavier kernels, greater grains and biological yield and had higher harvest index than solid row geometry. Performance of the two wheat varieties, Fakhar-e-Sarhad and Ghaznavi-98 was better as compared to other four varieties of wheat i.e., Bakhtawar-92, Nowshera-96, Chakwal and Khyber-87.

Keyword: wheat varieties, solid row geometry, skip row geometry, yield.

INTRODUCTION

Wheat (*Triticum aestivum* L.) belongs to family Poaceae (Gramineae) tribe Hordeae and genus Triticum. Wheat is a vital source of carbohydrates and contains important substance "gluten" which increases its demand for baking products. The straw is also used as fodder. It is estimated that 5-10% wheat grain is now being consumed as poultry and livestock feed. (Nazir, 1984).

Cereals are an important dietary protein source throughout the world, because they constitute the main protein and energy supply in most countries. Wheat is one of the major cereal crops with a unique protein, which is consumed by the humans and is grown around the world in diverse environments. It has already been known that gluten proteins have a primer role in wheat flour quality. It is recognized that variation in protein contents and composition significantly affect wheat quality with subsequent influence on baking quality.

Wheat is the leading food grain of Pakistan and being the staple diet of the people. It occupies a central position in agricultural policies. 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. 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 Pakhtunkhwa the total area occupied by wheat was 1.8 million hectares, which produced 1.21 million tons (MINFAL, 2009-2010).

Our farmers have small un-economical holding. Without ploughing of land, 44% reduction in wheat grains and 38% increased in weed intensity has been recorded (Grewal *et al*., 1989). A subsistence level farming is practiced with no saving for the purchases of modern and efficient tillage implements mounted on tractors for thorough preparation because of weeds control and reducing evaporation from soil will increase water holding capacity and WUE (Cholick, 1978).

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 (Chattha, 1984).

Planting geometry has a direct relation to light interception and utilization which is prerequisite for photosynthesis. Skip planting geometry with pairs of row allow more light penetration inside plant canopy, while in solid geometry the field is more populated and there is less light penetration inside plant canopy. Skip or wider planting geometry makes application of herbicides, other fertilizer and intercultural practices for weed control easier as compared to solid planting geometry. Narrow row spacing results in higher leaf photosynthesis and suppresses weed growth due to smothering effect compared with wider row spacing (Dwyer *et al*., 1991). Adjusting planting geometry to narrow row spacing has higher radiation use efficiency during grain filling which further contributes to higher dry matter yield (Tollenear and Aguilera, 1992).

Keeping in view the importance of planting geometries and its influence on wheat yield the present research was designed to test the hypothesis of variations

in yield of the two planting geometries using six varieties of wheat.

MATERIALS AND METHODS

The experiment was conducted at New Developmental Farm, Khyber Pakhtunkhwa Agricultural University, Peshawar, Pakistan during wheat growing season of 2002-03. 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 experimental set up was Randomized Complete Block Design (RCBD) with split plot arrangements having three replications.

Row geometry (skip, solid) was allotted to main plot and varieties (Bakhtawar-92, Fakhar-e-Sarhad, Ghaznavi-98, Nowshera-96, Chakwal, Khyber-87) were allotted to sub plot. Sub plot size was 2.4m by 5m, having eight rows 30cm apart in solid sowing and three pair or row 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 November 18th, 2002. Sowing was done by dropping the seed in furrow drawn by hand hoe and then covering the seed. Data were collected on number of grains/spike, kernel weight, grain yield, biological yield and harvest index.

Data regarding number of grains $spike^{-1}$ was calculated from randomly counting gains in five spikes and converted into average by dividing total number of grains over number of spikes. Data on kernel weight was recorded by weighing 1000 grains from the produced of each plot. To record grain yield the weight of threshed clean grains of each experimental unit was recorded. Data for total above ground dry matter yield or biological yield was recorded by weighing bundles from each plot. Harvest index was calculated by dividing grain yield over biological yield and then multiplied with 100. Least Significant Test was used to test the significance of differences among means of different treatments.

RESULTS AND DISCUSSIONS

Number of grains $spike^{-1}$

The data on average number of grains $spike^{-1}$ are presented in Table-1. The statistical analysis of the data showed no significant effects of both the factors i.e., planting geometry and different wheat varieties on number of grains $spike^{-1}$. Similarly the interaction of both the factors also showed non significant effect on number of grains $spike^{-1}$. This result is in conformity with (Kurchania, 1997) who reported that with increased row spacing the number of grains $spike^{-1}$ decreased. The concerned observations are also in conformity with the result of (Shaukat, 1995) who reported that as row spacing increased the number of grains $spike^{-1}$ decreased.

Kernel weight (g)

The statistical analysis of the data regarding kernel weight reported that planting geometry as well as varieties had non-significant effect on kernel weight showed in Table-1. This result is in contrast with (Duncan, 1997) who reported that thousand grain weight increased with the increased in row spacing. But (Kler and Dains, 1992) reported similar result that as row spacing increased in wheat, kernel weight decreased.

Grain yield (kg ha^{-1})

The statistical analysis in Table-1 revealed that planting geometry had significant effect on grain yield. Differences among the varieties were also significant for grain yield, while interaction of both the factors showed non-significant effect. The mean values of both the planting geometries i.e., solid row sowing and skip row sowing showed that skip row geometry produced higher grain yield as compared to solid geometry. The probable reason might be due to that in wider spaced rows the light interception is more and thus photosynthetic activity will be promoted producing higher grain yield. This result is similar to (Nazir *et al*., 1984) who reported that as row spacing became more grain yield enhanced. The mean values for the varieties showed that Ghaznavi-98 produced the highest grain yield (2796kg ha^{-1}) followed by Fakhar-e-Sarhad, (2708 kg ha^{-1}) while Khyber-87 produced the lowest grain yield (1588 kg ha^{-1}).

Biological yield (kgha^{-1})

Data collected on biological yield are given in Table-1. The statistical analysis of the data revealed that planting geometry as well as varieties had significant effect on biological yield. The mean values for the planting geometries showed that skip row sowing produced higher biological yield (7884 kg ha^{-1}) while solid row geometry produced lower biological yield (6902 kg ha^{-1}). This result is similar to (Prasad 1987) who reported more biological yield in skip row geometry. Similarly the mean values for the six wheat varieties revealed that Ghaznavi-98 produced more biological yield (8421 kg ha^{-1}), while Khyber-87 produced the lowest biological yield (5150 kg ha^{-1}).

Harvest index (%)

Harvest index data in Table-1 shows that none of the factors had a significant effect on harvest index. This may be due to heavier Kernal weight in skip row geometry. This result is in the conformity with (Cholick 1978) who reported that as row spacing increased harvest index decreased.

Table-1. Yield of wheat varieties under solid and skip row geometries.

Treatments	No. of grain spike^{-1}	Kernel weight (g)	Grain yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index (%)
Row geometry (Factor A)					
Solid	39.0	34.0	1990b	6902b	28.5
Skip	50.0	47.0	2760a	7884a	35.1
LSD	ns	ns	388.9	437.2	ns
Varieties (Factor B)					
Bakhtawar-92	40.1	45.5	2485bc	7503c	31.1
Fakhar-e-Sarhad	47.3	47.3	2708a	7854bc	34.1
Ghaznav-98	46.0	44.0	2796a	8421a	33.0
Nowshera-96	45.3	43.0	2346c	7499c	31.3
Chakwal	40.1	41.4	2327c	7950b	29.0
Khyber-87	44.6	42.1	1588d	5150b	30.8
LSD	Ns	ns	397.2	433.9	ns
Interaction (A x B)					
Bakhawar X SoRG	40.0	41.6	2035	6510f	30.0
Fakhar-e-Sarhad X SoRG	41.3	43.3	2250	6926ef	32.2
Ghaznav-98 X SoRG	39.6	40.3	2300	7800cd	29.5
Nowshera-96 X SoRG	38.6	39.6	2040	7233de	28.3
Chakwal X SoRG	35.6	36.6	1902	7840cd	24.0
Khyber-87 X SoRG	39.3	39.0	1411	5106g	27.5
Bakhawar X SkRG	50.3	49.3	2935	8463ab	36.3
Fakhar-e-Sarhad X SkRG	53.3	51.3	3163	8783a	36.0
Ghaznav-98 X SkRG	52.3	47.6	3293	9043a	36.3
Nowshera-96 X SkRG	52.0	46.3	2653	7766cd	34.3
Chakwal X SkRG	44.6	46.3	2752	8060bc	33.8
Khyber-87 X SkRG	50.0	45.3	1766	5193g	34.1
LSD	ns	ns	ns	613.7	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 study that skip-row-geometry produced better results than solid-row-geometry. While in all the six varieties of wheat, Fakhar-e-Sarhad and Gaznavi-98 were better in performance as compared to other verities. Therefore, both these varieties sown in skip-row-geometry are recommended for sowing to farmer community at Peshawar valley.

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