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Research Article

Effect of Row Spacing and Methods of Sowing on the Performance of Maize

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Abstract

An experiment was conducted at malik kelow wand, Malakand division in order to study the "Effect of row spacing and methods of sowing on the performance of maize". Randomized complete block design with split plot arrangement was used in the experiments. Maize hybrid and variety Azam were allotted to the main plots whilst sowing method to sub plots. Data were recorded on plant height, number of leaves plant^{-1}, number of grains cob^{-1}, 1000 grains weight, and number of plants at harvest and grain yield. All the parameters except leaves plant^{-1} were significantly affected by sowing methods. Significantly shorter plant (40 cm), highest grains cob^{-1} (409) and plants at harvest (116) were recorded when seed broadcasted. Plants sown in line having (60 cm) row to row distance had highest plant (45 cm), heavier 1000 grains weight and highest grain yield of 2363 kg ha^{-1}. Hybrid-3025 sown in line having 60 cm row to distance produce more grain yield of (kg ha^{-1}) as compared to Azam variety.

Keywords: Maize; Row spacing; Azam variety; Hybrid-3025

Introduction

Maize (*Zea mays L*) is a cereal grain that belongs to family poaceae. More than 50% of the total maize production is contributed by NWFP. About 64% of maize is grown under irrigation in Pakistan while the rest rainfed. It is rich source of food and fodder and also used in industries for manufacturing of corn oil, corn flakes, corn syrup and corn sugar [1]. The world leading maize growing countries are USA, Argentina, Russia, India, Brazil and China. The total area under maize crop in Pakistan was 981.8 thousand hectares during 2004-2005 with a total production of 2797.0 thousand tones with an average yield of 2849 kg per hectare, while in NWFP total area under maize crop was 498.6 thousand hectares with a total production of 855.5 thousand tones with an average yield of 1716 kg per hectares [2].

Maize has a great potential for yield than any other cereal crop but the average yield is very low in Pakistan than any other cereal crop. This is due to unavailability of improved varieties, improper planting density and improved sowing methods. Row spacing, sowing methods and the variety plays an important role in enhancing crop yield. Buchele [3] observed that line favored the weight and length of maize stalk. However, crop yields (grain and stalk yield) in this case differed a little form other system of planting. Dornescus [4] compared nine maize hybrids for grain yield grown at 50,000, 65,000 and 80,000 plants ha^{-1}.They noticed that grain yield increased with increasing plant density and maximum grain yield of 6.33 tones ha^{-1} was obtained at 80,000 plants ha^{-1}. Singh and Srivastava [5] studied the response of maize cultivar kisan composite to different planting densities. They observed at grain yield of 5.28, 4.69 and 3.89 t ha^{-1} at plant densities of 88889, 66667 and 44445 ha^{-1} respectively. Ear and grain number plant^{-1} and 1000 grain weight increased with decreasing plant densities. Khan et al. [6] grown two maize cultivars Azam and Sarhad White at three plant population (53,000, 72,000 and 93,000 plant ha^{-1}) and at three NPK levels: 80-57-0 and 240-86-0 kg ha^{-1} at Cereal Crops Research Institute Pirsabak Nowshera. They found a significant cultivar x Density x fertilizer interaction for grain yield. Sarhad White produced highest grain yield of 817 kg ha^{-1} at a density of 53000 plant ha^{-1} with a 240-86-0 NPK kg ha^{-1}. The higher yield of 5643 kg ha^{-1} was received from Azam at a density of 72000 plants ha^{-1} with 160-57-0 NPK ha^{-1} as compared to lower rates of fertilizer, when averaged across plant density and cultivar. Husaun et al. [7] established experiments at two sites in the Bannu area in 1992 by line sowing or broadcasting, with different combinations of local or improved cultivars, fertilizer rate and insecticide (diazinon). Grain yield at both sites was higher for line sowing. Yield was lowest form a local cultivar and reduced fertilizer rates (50:25 kg N ha^{-1}). The present study was conducted with aim to determine optimum row spacing, appropriate sowing method and its effect on yield of maize varieties.

Materials and Methods

A study "Effect of row spacing and methods of sowing on the performance of maize" was conducted at Malik Khelow wand Malakand Agency during June 2006.The crop was sown at seed rate of 40 kg ha^{-1} in summer 2006.The experiment was laid out in Randomized Complete Block Design (RCBD) with split plot arrangement The varieties (Azam and Hybrid-3025) were kept in main plot while sowing methods (Broadcast and Line sowing) where allotted to sub plot. The plot size was kept 5 m x 1.8 m. Basel dose of NPK was applied at the rate of 200, 90 and 60 kg ha^{-1} respectively.

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Table 1: Soil Physico-chemical analysis.

Characteristics of Soil	Values
Sand (%)	65
Silt (%)	12
Clay (%)	23
Texture	Sandy clay loam
Field capacity (%)	22.4
Wilting point (%)	6.3
Soil pH	7.51
E.C. (dS m^{-1})	1.5
Soil organic matter (%)	0.72

The Soil Physico-chemical analysis was also measured as mention in Table 1.

Factor A (Main plot)

1. Azam (variety)
2. Hybrid-3025

Factor B (Sub plot)

Sowing methods

a. Broadcast

b. Line sowing (30 cm apart)

c. Line sowing (60 cm apart)

The following parameter was studied during the experiment

Height of ten plants randomly selected in each plot was measured at 5 leaf stage by measuring tap, and average plant height was calculated. Numbers of leaves were counted for randomly selected 10 plants in each plot and average was calculated. To record number of grains per cob, grains of two randomly selected cobs in each treatment were counted and then averaged. Thousand grains were selected from each subplot threshed grains and then weighed by an electronic balance to record its weight. Number of plants in central row were counted at time of harvest in each subplot and then averaged. Whilst in broadcast method the entire plants in each plant were counted. Two central rows were harvested in each subplot. The ears were dehusked, dried and then threshed. The total grain weight for sampled material was recorded and converted into grain yield ha^{-1}. In case of broadcast method, the entire plot was harvested and grain yield was recorded.

All the obtained data was statistically analyzed according to the appropriate design. LSD test was employed when F-values were found significant for both factors.

Results

Plant height (cm)

Mean value of data given in Table 2 shows that significant differences were observed in plant height. Azam variety had significant more plant height 41 cm as compared with hybrid -3025. Maize sown with line at row to row distance of 60 cm had significantly more plant height 45 cm while those sown with broadcast had less 35 cm. Hybrid-3025 sown in line at row to row distance of 60 cm had significantly more plant height 45 cm.

Table 2: Effect of sowing method on plant height (cm) of maize varieties at 5 leaf stage.

Sowing methods	Varieties		Mean
	Hybrid	Azam	
Broadcast	31c	40b	35c
Line sowing (30 cm)	42ab	37b	39b
Line sowing (60 cm)	46a	45a	45a
Mean	39	41	

LSD value at p_<0.05 for sowing methods =3
LSD value at p_<0.05 for interaction =4
Means value of the same category followed by different letters are significant at P_<0.05 level.

Table 3: Effect of sowing methods on number of leaves $plant^{-1}$ of maize varieties.

Sowing methods	Varieties		Mean
	Hybrid	Azam	
Broadcost	11	11	11
Line sowing (30 cm)	11	12	12
Line sowing (60 cm)	13	10	11
Mean	11.7	11	

Table 4: Effect of sowing methods on grains cob^{-1} of maize varieties.

Sowing methods	Varieties		Mean
	Hybrid	Azam	
Broadcost	409	398c	404a
Line sowing (30 cm)	232f	380d	306c
Line sowing (60 cm)	311e	481a	396b

LSD value at P_<0.05 varieties =3
LSD value at P_<0.05 for interaction =3
LSD value of the same category followed by different letters are significant at P_<0.05 level.

Number of leaves $plant^{-1}$

Data recorded on number of leaves $plant^{-1}$ in Table 3 revealed that it was not significantly affected by method of sowing and the interaction of sowing methods to variety was also non significant. Hybrid-3025 had more number of leaves plant 12 as compared with Azam. The interaction also observed non significant.

Number of grain cob^{-1}

Mean value of data given in Table 4 shows that significant differences were observed in number of grains cob in maize. Azam variety had significantly more grain cob^{-1} 419 as compared with hybrid-3025. Maize sown with broadcast method had significantly more grain cob 403 while those sown in line at row to row distance of 30 cm had the lowest 306 grains cob^{-1}. Among the interaction Azam variety sown in line with row to row distance of 60 cm produced significant more grains cob^{-1} 480.

1000 grains weight

Data presented in Table 5 shows that significant differences were observed in 1000 grains weight. Hybrid-3025 had significantly more 1000 grains weight 234.6 g as compared of 30 cm had significantly more 1000 grains weight 266-5 g while those sown in line at row to row distance of 60 cm had the lowest value. Hybrid-3025 sown in line at row to row distance of 30 cm produced significantly more 1000 grains weight 323.0 g.

Table 5: Effect of sowing methods on 1000 grain weight (g) of maize varieties.

Sowing methods	Varieties		Mean
	Hybrid	Azam	
Broadcost	197.00e	222.00b	209.50b
Line sowing (30 cm)	323.00a	210.00c	266.50a
Line sowing (60 cm)	184f	204.00d	194.00c

LSD value at p-<0.05 for varieties =3.322
LSD value at P_<0.05 for sowing methods =3.322
LSD value at P_<0.05 for interaction =4.697
Means value of the same category followed by different letters are significant at P_<0.05 level.

Table 6: Effect sowing methods on number of plants at harvest of maize varieties.

Sowing methods	Varieties		Mean
	Hybrid	Azam	
Broadcost	116	116	103a
Line sowing (30 cm)	111	109	110a
Line sowing (60 cm)	100	73	86b
Mean	100	98	

LSD value at P_<0.05 for sowing methods=5
Means value of same category followed by different letters are significant at P_<0.05 level.

Number of plant at harvest

The mean value of data given Table 6 reveled that significant difference were observed in number of plant at harvest. Hybrid-3025 had significantly more number of plants at harvest 100 as compared with variety Azam. Maize sown in broadcast had significantly more number of plants at harvest 113 while those sown with broadcast had significantly more number of plants at harvest 116.

Grain yield

Table 7 demonstrated that significant Difference in Grain yield. Hybrid-3025 had significantly produced more grain Yield 2263 kg ha^{-1} as compared with significantly more grain yield 2092 kg ha^{-1} while those sown with broadcast had the lowest.

Discussion

The results obtain on various parameters during the experiment titled "Effect of row spacing and methods of sowing on the performance of maize" was conduct at malik khelow wand Malakand agency during June 2006. Significant differences were observed in plant height of maize varieties. Azam variety performed better than hybrid-3025, this may be attributed to the variety character. Lines sowing having row to row distance of 60 cm achieve significantly maximum plant height because of extra space availability and luxury consumption of nutrient enhanced the plant height. Our result is in agreement with those reported by Hassan [8]. Non significant differences were observed in number of leaves $plant^{-1}$ of maize hydride 3025 and variety Azam. Hybrid-3025 produced more number of leaves $plant^{-1}$. Line sowing having row to row distance of 30 cm produced of leaves of leaves $plant^{-1}$ because of varietal character. The interaction remain also non significant. And our result is in agreement with those reported by Hassan [8].

Significant differences were observed in number of grain cob^{-1} of maize Hybrid-3025 and variety Azam performed better than Hybrid-3025. Broadcast method of sowing produced significantly more grains cob^{-1} because of larger space and luxury consumption of nutrient enhances grains cob^{-1}. The highest number of grain cob^{-1}in plot sown with broad cost method could be due to fact that Azam variety is better adapted to the existing condition of plant growth and is in agreement with those reported by Singh and Srivastava [5]. Significant differences were observed in 1000 grains weight of maize Hybrid-3025 and variety Azam showed that Hybrid-3025 performed better than Azam variety. Line sowing having row to row distance of 30 cm produced significantly more 1000 grains weight because of grain size. The highest number of 1000 grains weight in plot sown with line sowing having row to row distance of 30 cm could be due to accumulation of photosyntates and light penetration and is in agreement with those reported by Singh and Srivastava [5]. Hybrid-3025 produced significantly more 1000 grains weight was sown in line having 30 cm row to row distance. Significant differences were observed in number of plants at harvest of maize Hybrid-3025 and variety Azam showed that Hybrid-3025 Performed better than Azam variety. Broadcast produced significantly more number of plants at harvest because when space are smaller, there will be more plants. The highest number of plants at harvest could be due to different seed rates. And is in agreement with those reported by Mohammed [9] Hybrid-3025 produced significantly more number of plants at harvest was sown with broad cost.

Table 7: Effect of sowing methods on grain yield (kg ha^{-1}) of maize varieties.

Sowing methods	Varieties		Mean
	Hybrid	Azam	
Broadcost	2257 ab	1957 c	2107
Line sowing (30 cm)	2170b	1922cd	2046
Line sowing (60 cm)	2363a	1821d	2092
Mean	2263a	1900b	

LSD value at P_<0.05 for varieties =62
LSD value at P_<0.05 for interaction =107
Means value of the same category followed by different letters are significant at P_<0.05 level.

Significant differences were observed in grain yield of maize Hybrid-3025 and variety Azam showed that hybrid-3025 Performed better than Azam variety. The highest grain yield in plot sown with line sowing having row to row distance of 60 cm could be due to proper climate adoptability and is in agreement with those reported by Dornescus [4]. Azam variety produced significantly maximum grain yield was sown in line having 60 cm row to row distance.

Conclusion

From this experiment we concluded that variety azam sown on line/ ridges with a space of 60 cm is better than from the variety sown with sown the method of broad cost and less row spacing. On the basis of conclusion we recommended that the variety Azam with a space of 60 cm is best. Since it was a short term trial, therefore, long term study should be conducted for generalization accurate recommended that in future student the maize Azam should be study in comparison with other approved open pollinated varieties.

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