▼ Journal of Research (Science), Bahauddin Zakariya University, Multan, Pakistan.
Vol.13, No.2, December 2002, pp. 135-138 ISSN 1021-1012

IMPACT OF INTRA-ROW SPACING ON GROWTH AND YIELD OF SOME MAIZE CULTIVARS

Muhammad Bismillah Khan, Muhammad Asif, Madiha Aman and Tauqeer Ahmad
Department of Agronomy, Bahauddin Zakariya University, Multan, Pakistan.

Abstract: Response of four maize cultivars namely Agaiti-85, Akbar, Golden and Platinum to different planting densities of 15,20, and 25 cm was studied under field conditions during Kharif 2001 at Multan. Platinum and Agaity-85 produced greater number of grains cob^{-1} and 1000-grain weight and thus resulted in higher grain yield as compared to other cultivars included in this study. These cultivars also gave highest leaf area index and higher biological yield than Akbar and Golden. Yield and yield components were also influenced significantly by different seeding density levels. Maximum grain yield was recorded at 20 cm planting density level, while the leaf area index and grains cob^{-1} were greater at 25 and 20 cm planting density level while 1000 grain weight was greater in 25 and 20 cm level and lowest at 15 cm level.

Keywords: Cultivars, growth, intra-row spacing, maize, planting density, yield and yield components.

INTRODUCTION

Maize (*Zea mays* L.) is third most important cereal crop of Pakistan after wheat and rice. In Pakistan maize is grown on an area of 944 thousand hectares with total production of 1643.2 thousand tons giving an average yield of 1741 kg ha^{-1} which is 35% lower than international level [Anonymous 2002]. High plant densities are used to increase crop yield per unit area while yield per plant decreases with increased plant densities. Total light interception by the canopy is maximized and total yield is increased. Modarres *et al*. [1999] reported that high plant densities significantly increased leaf area, grain yield and harvest index in different maize cultivars compared with low plant densities. Thakur *et al.* [2000] reported that marketable baby corn yields were higher in cv. VL-42 than in early composite and highest at a spacing of 40 cm x 40 cm. Sukanya *et al.* [1998] reported that sweet corn cv. YBC-750 gave significantly the maximum yield 37.85 q h^{-1} as compared to other cultivars included in the study. These variations in the yield were primarily due to differences in growth parameters and wider spacing 45 cm x 30 cm. significantly promoted yield than other spacing. Wider spacing (45 cm x 30 cm) significantly promoted grain yield of corn compared with narrow rows. Keeping in view the above findings, this study was designed to find out the best combination of planting density and cultivar suited to agro-ecological conditions of Multan.

MATERIALS AND METHODS

This study was conducted at the Research Area, University College of Agriculture, Bahauddin Zakariya University, Multan, during Kharif 2002. The soil was clayey loam, non-acidic, low in organic matter, not well drained with high water retaining capacity.

Crop was sown in 75 cm apart single rows. The experiment was laid out in split plot design with factorial arrangement with three replications and having a net plot size of 3x3.7 m^2. Four maize cultivars viz. Platinum, Akbar, Agaiti-85 and Golden were randomized in the main plots while three intra-row spacing i.e.15, 20 and 25 cm were arranged in such plots. All other agronomic practices were kept normal and uniform for all the treatments. The growth and yield parameters studied were plant population, plant height, cobs $plant^{-1}$, grains cob^{-1} thousand grain weight, biological and economic yield, harvest and leaf area indices.

Data collected were analyzed, statistically using Fisher's analysis of variance technique and least significant difference test at 0.05-probability level was employed to compare the differences among the treatment's means [Steel and Torrie 1984].

RESULTS AND DISCUSSION

Plant population decreased significantly in cv. Akbar, however, it was at par in rest of the three cultivars. This decrease in plant stand of cv. Akbar can be attributed to lesser germiability (Table 1). Each intra-row spacing level significantly affected the crop stand. Maximum number of plants (80.8) was found in 15 cm spacing level and minimum (59.3) at 25 cm. It is very much clear that closer the plants, higher will be population and this was achieved by thinning the crop at 4-leave stage. The interaction between varieties and spacing was found significant.

Table 1: Impact of intra-row spacing on growth and yield of some maize cultivars.

Treatments / Varieties	Plant Population	Leaf Area Index (LAI)	Plant Height (cm)	Cobs $Plant^{-1}$	Grains Cob^{-1}	1000-Grain Weight (g)	Grain Yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
Agaiti-85	75.7 a	0.80	169.20	1.30	459.5ab	230.6 a	3.08 a	23.1 ab	13.10 a
Akbar	58.5 b	0.78	176.20	1.10	438.48b	167.6 b	2.02 b	14.6 b	13.80 b
Golden	78.1 a	0.79	179.30	1.10	425.18b	182.2 b	1.99 d	24.2 a	8.22 b
Platinum	72.3 a	0.89	183.80	1.20	4 77.9a	236.9 a	3.15 a	22.3 ab	14.13 a
Planting densities									
15cm	80.8 a	0.76	185.20	1.2	446.60	186.4 b	3.86	25.72a	15 b
20cm	73.3 b	0.78	175.20	1.2	451.95	202.5 ab	3.96	21.44b	18.47 ab
25cm	59.3 c	0.79	175.26	1.2	452.20	223.4 a	3.77	17.72c	21.28 a
Interaction	*	**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Any two means sharing a letter in common are statistically non-significant at 0.05 probability level
* = Significant, ** = Highly Significant.

Leaves are neither varied among varieties, nor intra-row spacing affected it. However, interaction among varieties and spacing was highly significant (Table 1). Platinum maintained at 25 cm spacing produced the

highest LAI (0.96) and cv. Akbar at 15 cm plant spacing gave the lowest (0.48). These results confirmed the findings of Modarres *et al.* [1999] and Sukanya *et al.* [1998]. Statistically similar plant height was recorded in all corn cultivars. In different planting densities, differences in plant height were again non-significant. Among different cultivars and at different spacing levels statistically similar cobs plant^{-1} were recorded. Significantly different number of grains cob^{-1} was produced in different cultivars included in this study. The cv. Platinum produced the highest number of grains cob^{-1} (477.9), however these were statistically at par with those of Agaiti-85. Golden variety gave lowest number of grains cob^{-1} (425.1). This varying number of grains might be attributed to different genetic potential in each variety.

The maize cultivars differed significantly from each other in 1000-grain weight. Platinum produced the highest 1000-grain weight (236.9g) that was statistically at par with that of Agatit-85 and the lowest (167.6g) in Akbar. These findings are in agreement with those of Ahmed *et al*. [1997]. Intra-row spacing also influenced the grain weight significantly. Cobs in 25 cm planting density produced maximum (223.4 g) and statistically significant grain weight as compared to other closer spaces and it was minimum (186.4 g) in the closest intra-row space. In wider spaces higher interception of solar radiation and lesser competition for nutrients contributed towards more dry matter production. The interaction between varieties and densities was non-significant.

Grain yield was affected significantly among various cultivars of maize (Table 1). Platinum gave the highest grain yield (3.15 t ha^{-1}), however, it was statistically at par with the yield of Agaiti-85.Golden resulted in the lowest grain yield of 1.99 t ha^{-1}. Better leaf expansion, more number of grains per cob and higher 1000-grain weight in Platinum contributed towards its higher grain yield as compared to the other varieties. These results are similar to those reported by Modarres *et al.* [1998] and Thakur *et al*. [2000]. Different planting densities did not differ significantly in the grain yield. Similar to grain yield, significant differences were found between genotypes of maize for biological yield. The genotype Golden gave the highest biological yield (24.2 t ha^{-1}) that was statistically at par with Agaiti-85 (23.1 t ha^{-1}) while the lowest biological yield was given by Akbar (14.6 t ha^{-1}). It is inferred from the results that Platinum converted dry matter into starch at better rate as compared to Golden. Due to this biomass produced in golden was higher than rest of the varieties, however, grain yield decreased owing to its poor rate of starch accumulation in the grains. Chandra *et al*. [1999] also reported similar results. Planting densities also differed significantly in total biomass production. Due to higher plant stand the significantly highest biological yield of 25.72 t ha^{-1} was recorded in 15 cm spacing and lowest (17.72 t ha^{-1}) in the widest space due to thin plant stand. The interaction between varieties and planting densities remained non-significant.

Harvest index varied significantly among different cultivars of maize. Platinum gave the highest harvest index (14.13) that was statistically at par with that of Agaiti-85. The seeding density of 25 cm gave highest harvest index (21.28), which was statistically at par with the seeding density of 20 cm and the lowest (15.0) in 15 cm. Harvest index is a ratio between grain yield and total biomass of the plant. It is clear from the data in table 1 that platinum variety produced higher grain and lesser biomass, which resulted in higher harvest index. Similarly in 25 cm intra-row spacing the better harvest index was due to lesser biomass production as compared to the rest of planting densities.

CONCLUSIONS

The cultivar Platinum may be preferred over other cultivars due to higher grain yield. Moreover, 20 cm plant-to-plant distance should be maintained by thinning for better yield.

References

Ahmad, A., Mahmood, N. and Akhtar, B. (**1997**) "Effect of different depths of irrigation on the grain yield of promising late sown wheat cultivars", *Rachis,* 16 (1-2), 77-80.

Anonymous (2002) "Agricultural Statistics of Pakistan", Government of Pakistan, Ministry of Food Agriculture and Livestock Division (Economic Wing), Islamabad, Pakistan, pp. 18-19.

Chandra, R. and Kumar, A. (**1999**) "Dry matter production and yield of wheat genotypes as influenced by irrigation frequency", *Annals of Biology,* 15(2), 209-211.

Modarres, A.M., Dijak, M., Hamelton, R.I., Dwyer, L.M., Stewart, D.W., Mather, D.E. and Smith, D.L. (**1999**) "Leafy reduced stature maize hybrid response to plant population density and planting pattern in a short growing season area", *Maydica,* 43(3), 227-234.

Steel, R.G.D. and Torrie, J.H. (**1984**) "Principles and procedures of statistics", 2nd ed., McGraw Hill Book Co. Inc. Singapore, pp. 172-177.

Sukanya, T.S., Nanjappa, H.V. and Ramachandrappa, B.K. (**1998**) "Growth parameters and yield of babycorn as influenced by varieties and spacing", *Mysore J. Agric. Sci.*, 32 (4), 264-268.

Thakur, D.R. and Sharma, V. (**2000**) "Effect of planting geometry on babycorn yield in hybrid and composite cultivars of maize", *Indian. J. Agric. Sci.*, 70(4), 246-247.