INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2003/05–2–217–218
http://www.ijab.org

Short Communication

Effect of Plant Population on the Growth and Yield Performance of Maize Crop

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ABSTRACT

Studies pertaining to the effect of some plant populations on the growth and yield of maize were conducted at Agronomic Research Area, University of Agriculture, Faisalabad. Plant populations comprised P-1 (166666 plants ha^{-1}), P-2 (111111 plants ha^{-1}), P-3 (83333 plants ha^{-1}), P-4 (66666 ha^{-1}) and P-5 (55555 plants ha^{-1}). Among all the five plant populations, maize plant population of 1,66,666 ha^{-1}, produced the highest yield of 6.63 tons ha^{-1} as against 6.59, 5.26, 4.68 and 3.28 t ha^{-1} for maize populations of 111111, 83333, 66666 and 55555 pants ha^{-1}, respectively. The highest plant height (314.7 cm) was noted with the minimum plant population.

Key Words: Maize; Plant population; Yield

INTRODUCTION

In the present era, the practice of planting the maize crop on wide row spacing is gaining popularity particularly among the farmers who know the role of plant populations and intend to intercrop for the enhancement of maize yield. The optimum per acre plant population is pre-requisite for higher yield of maize like other crops. It is observed that the major components of maize agro-technology responsible for low maize yield at farmer fields are generally low plant population and conventional planting methods at narrow plant spacing. It is, therefore, required to probe into plant spacing, which may give rise to suitable plant population per unit area. Being a broad leave and C-4 plant, maize makes best use of natural growth resources i.e. air, light, moisture etc. Previous studies have shown a tremendous response of maize to higher plant population but up to an optimum number of plants per unit area. The present study was initiated to evaluate the effect of plant population on growth and yield behavior of maize.

MATERIALS AND METHODS

The proposed study was conducted at the University of Agriculture, Faisalabad on a sandy loam soil during spring 2001. The experiment was laid out in randomized completed block design with four replications. Maize plant populations comprised P-1 (166666), P-2 (111111), P-3 (83333), P-4 (66666) and P-5 (55555). The crop was sown with a dibbler on a fixed row spacing of 60 cm by fixing the plant-to-plant distance of 10, 15, 20, 25 and 30 cm apart to get the desired plant populations.

Maize cv. Akbar was used as medium of trial. All the cultural practices were kept normal and uniform for all the treatments. A basal dose of fertilizer at the rate of 150 kg. N_2O and 75 kg P_2O_5 in the form of urea and single super phosphate was applied. Observations like final plant height, number of grains per cob, 1000-grain weight, grain yield per hectare and stover yield per hectare were recorded using standard procedures. The data collected were analyzed statistically by using Fisher's analysis of variance technique and least significant different (LSD) at 5% probability level was applied to compare the differences among treatment means (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Table I indicates that there were significant differences among the plant height of maize among the various plant populations. The highest plant height (314.7 cm) was recorded in the plot having plant population of (55,555 ha^{-1}) as against the smallest (303.6 cm.) in the plots having plant population of (111,111 and 88,333 ha^{-1}). The more height of maize plants in case of less plant population ha^{-1} was

Table I. Effect of plants population on the growth rate and yield performance of maize crop

Plant population	Final plant height (cm)	No. of Grains Cob $^{-1}$	1000 Grain Weight (g)	Grain Yield t ha $^{-1}$	Stover Yield t ha $^{-1}$
P-1 (166666 plants ha $^{-1}$)	303.7 b	396.1 d	185.8 e	6.93 a	21.21 a
P-2 (111111 plants ha $^{-1}$)	303.6 b	416.6 c	197.4 d	6.59 b	18.83 b
P-3 (83333 plants ha $^{-1}$)	303.6 b	421.3 c	199.5 c	5.26 b	15.83 c
P-4 (66666 plants ha $^{-1}$)	304.1 b	441.3 b	204.0 b	4.68 c	13.73 d
P-5 (55555 plants ha $^{-1}$)	314.7 a	495.1 a	224.3 a	3.28 d	11.36 c

Mean followed by the same letter do not differ significantly at 5 % probability level (LSD)

attributed to better nutrition and growth resources for the plants. Similar results were reported by Glenn and Paynar (1974).

It is clear from Table I that there were marked differences in the number of grains per cob among the different plant populations under study. Plots having population of 55,555 ha^{-1} produced more number of grains (495.2) per cob than rest of the plots. However, the differences among P-2 were found to be non-significant and less than P-1 and P-4 significantly. The variability in number of grains per cob was attributed to variable size of cob and grain formation process which are affected directly by population dynamic. Sherma and Adamu (1984) have also reported that in case of less plant population, more number of grains per cob was produced.

Table I further shows that 1000-grain weight was significantly influenced by different plant population under study. A linear effect of population was noted when population was decreased, gradually, like number of grain per cob, 1000-grain weight was attributed to the better growth facilities available at wider LxL and PxP distance. The findings of Tianu and Tianu (1983) are quite in agreement with these results. The perusal of Table I indicates highly significant differences in maize yield among various plant populations. Maize crop having plant population of 166,666 ha^{-1} on account of greater number of plants per unit area, produced significantly higher grain yield of 6.63 t ha^{-1} and was closely followed by that of 111,111 population recording on average 6.59 t ha^{-1} that as against the lowest of 3.28 t ha^{-1} in case of 55,555 populations.

CONCLUSION

The results further led to the conclusion that P-3 and P-4 yielded significantly higher with each and another. These results are supported by Russel (1969) and Hallman *et al.* (1981). The maximum stover yield of 21.21 t ha^{-1} that was recorded in plots having maximum plant population (P-1) as against the minimum of 11.36 t ha^{-1} in plots of minimum plant population (P-5). The differences may be attributed to variable number of plant population in different treatments. The results further led to the conclusion that P-1 i.e. higher maize plant population utilized the production resources more efficiently towards plant development than that of P-5 because of lower plant population per unit area.

REFERENCES

Glenn, F.B. and Paynar, 1974. Effect of Genotypes planting pattern and plant density on plant-to-plant variability and grain yield of corn. *Canadian J. Plant Sci.,* 54: 23–30

Hallman, H.L., D.M. Hedge and B.T. Kudasomannaver, 1891. Hybrid and local production with different plant densities and row spacing under transitional tract of Dharwad. *Mysore J. Agri. Sci.,* 15: 268–70

Russel, W.A., 1969. Hybrid performance of maize in bred lines selected by the test cross performance in low and high plants densities. *Crop Sci.,* 9: 135–8

Sharma, T.R. and I.M. Adamu, 1984. The effect of plant population on the yield attributing characters in maize. *Zeitschrift fur Acket and pflan Zenbau,* 153: 315–8

Steel, R.G.D. and J.H. Torrie, 1984. *Principles and Procedures of Statistics,* pp: 172–7. McGraw Hill Book Co., Tokyo, Japan

Tianu, A., I. Picu and M. Tianu, 1983. Influence of sowing density on some physiological elements in maize yield formation under irrigation problem. *de-Agrofitotennie teoretica Si Applicatia,* 5: 219–30

(Received 04 February 2003; Accepted 11 March 2003)