

EFFECT OF DIFFERENT LEVELS OF NITROGEN AND INTRA-ROW PLANT SPACING ON YIELD AND YIELD COMPONENTS OF MAIZE

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Effects of different levels of N and intra-row plant spacing on yield and yield components of maize cv. "Golden" was studied at the University of Agriculture, Faisalabad during 1998. The nitrogen levels comprised 0-100-140 and 180 kg ha⁻¹ while the intra-row plant spacing were 10, 20 and 30 cm. Both nitrogen and plant spacing had a significant effect on plant height, number of grains per cob, 1000-grain weight and harvest index. The maximum grain yield (5.7 t ha⁻¹) was produced when plant spacing was kept as 20 cm and N was applied at the rate of 180 kg ha⁻¹.

Key words: Nitrogen, intra-row plant spacing, yield components, maize

INTRODUCTION

Maize (*zea mays* L.) is an important food crop of the world production next to wheat and rice. Besides its industrial uses and food value for human being, it is equally useful as a feed for livestock and poultry. Maize is a short duration crop with high yield potential. In Pakistan, is grown on an area of 962.2 thousand hectares with total annual production of 1665.0 thousand tonnes and average yield of 1730 kg ha⁻¹ (Anon. 1999) which is much lower than that of many maize growing countries. Among different yield limiting factors, sub-optimal plant population and inadequate use of fertilizers especially the nitrogen are the major ones. Nitrogen being an essential plant nutrient has a direct bearing effect on the final maize yield. Besides its role in protein synthesis and nucleic acid, it is an structural components of chlorophyll. A significant linear increase in yield of maize with increasing rate of N application has been reported by Khan *et al.* (1994). Nitrogen also improved the oil content of maize grain (Muhammad *et al.*, 1992). Grain yield increased linearly with increasing plant density until other production factors were not limiting (Anjum *et al.* 1992). Optimum plant population increased number of grains cob⁻¹, 1000-grain weight and grain yield of maize (Sabir *et al.* 1987). Keeping this in view, the present study has been conducted to determine the effect of nitrogen and intra-row plant spacing on yield and yield components of maize cv. "Golden" under the agro-ecological condition of Faisalabad.

MATERIALS AND METHODS

This experiment was conducted at University of Agriculture, Faisalabad during 1998. The experiment was laid out in a split plot design with three replication keeping the nitrogen and intra-row spacing in the main and sub plots, respectively. The plot size was 3 m x 6 m. The experimental treatments comprised four nitrogen levels. (0, 100, 140 and 180 kg ha⁻¹) while the intra-row plant spacing were 10, 20 and 30 cm. The crop was sown on August 7, 1998. The phosphorus @ 90 kg ha⁻¹ and one third of N was applied as a basal dose at the time sowing. The remaining N was applied in two equal splits, i.e.

one third by band placement at the time of first irrigation and one third as top dressing at flowering. The crop was sown in 60 cm spaced rows with intra-row plant spacing of 10, 20 and 30 cm with the help of single row hand drill. The crop was thinned at 3-4 leaf stage to maintain one plant per hill. All the other agronomic practices were kept normal and uniform for all the treatments. At crop maturity, observations on desired parameter were recorded using standard procedures. The data collected were statistically analyzed by using Fisher's analysis of variance technique and treatment means were compared by LSD (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Plant height at maturity: Plant spacing of 10 cm produced plant height (230.20 cm) followed by that with 20 and 30 cm which with plant height of 224.6 and 216.9 cm, respectively. Nitrogen levels affected the plant height significantly. Although application of N at the rate of 180 kg ha⁻¹ gave the maximum plant height which was at par with 140 kg N ha⁻¹; Significantly the minimum plant height was recorded in check plots. These results are in line with those of Ahmad (1980) who revealed that plant height increased by increasing N and decreasing plant population. Javed *et al.* (1985) reported that plant height increased with NPK combination of 100-50-60 kg ha⁻¹; Bakht *et al.* (1989) concluded that maximum plant height (204.17 cm) was observed at 180 kg ha⁻¹.

Numbers of grains cob⁻¹: Plant spacing of 30 cm produced more number of grains cob⁻¹ (416.30) than that 20 cm plant spacing (410.20). Maximum number of grains cob⁻¹ (416.75) was recorded with 180 kg N ha⁻¹ against the minimum of 399.10 in the check. These results are in conformity with those of Javed *et al.* (1985) who observed that increased the number of grains cob⁻¹ with NPK combination of 100-50-60. Thakur *et al.* (1991) reported that application of N upto 60 kg ha⁻¹ increased number of grains cob⁻¹.

1000-grain weight: Plant spacing 000 cm produced significantly the highest 1000-grain weight (263.60g) while mini-

imum (249.60 g) was recorded at 10 cm plant spacing. Regarding N levels the maximum 1000-grain weight (262.40g) was recorded with 180 kg N ha⁻¹ and the minimum (248.00 g) in the control. The rest of the N rates were significantly different from one another. These findings are in accordance with those of Ahmad (1980) reported that maximum 1000 grain weight was recorded with the application of 150 kg N ha⁻¹ and 57000 plants ha⁻¹. Thakur et al. (1991) observed that application of 60 kg N ha⁻¹ increased 1000-grain weight.

Grain yield ha⁻¹: Plant spacing of 10 cm produced the lowest grain yield (4.30 t ha⁻¹) while plant spacing of 20 and 30 cm were at par with each other and produced grain yield of 5.1 and 4.4 t ha⁻¹, respectively. The grain yield of 5.7 t ha⁻¹ was produced by 180 kg N ha⁻¹ followed by 140 kg ha⁻¹ which was significantly higher than 100 kg N ha⁻¹. These results are in conformity with those of Bangarwa et al. (1988) who reported

that maximum grain yield (7.27 t ha⁻¹) was obtained with 90000 plants ha⁻¹ given 180 kg N ha⁻¹, Thakur et al. (1991) concluded that application of N upto 60 kg ha⁻¹ increased the grain yield.

Harvest Index (%): The harvest index was not influenced significantly by different plant spacing while different nitrogen levels had significant effect. Application of 180 and 140 kg N ha⁻¹ gave the maximum harvest index of 34.9 and 32.2 %, respectively against the minimum of 23.25 in control plots. These results are in line with the findings of Bangarwa et al. (1988) who reported that harvest index decreased with increasing plant density but increased with increase in N rate. Conclusion: Maximum grain yield of maize cv. Golden can be achieved with application of 180 kg N ha⁻¹ by maintaining intra-row plant spacing of 20 cm under the agro-ecological conditions of Faisalabad.

Table 1. Yield and yield components of maize as affected by intra-row spacing and nitrogen application

Treatment	Plant height (cm)	Grain cob's (No.)	1000-grain weight (g)	Grain yield (t ha ⁻¹)	Harvest Index (%)
a) Plant spacing (cm)					
P ₁ = 60x10	230.2a	403.3c	249.6b	4.3b	31.3 ^{NS}
P ₂ = 60x20	224.6b	410.2b	256.4b	5.1a	28.8
P ₃ = 60x30	216.9c	416.3a	263.6a	4.4a	28.6
b) Nitrogen rates (kg ha ⁻¹)					
Fa control	219.9c	399.1c	248.0c	3.3a	23.0d
F ₁ = 100	22.9b	410.6b	256.8c	4.4b	27.6c
F ₂ = 140	225.5a	413.3b	258.8b	5.2a	32.7b
F ₃ = 180	228.2a	416.8a	262.4a	5.7a	34.9a

Any two means not sharing a letter in common differ significantly at P 0.05 ..

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