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Short Communication

Effect of Nitrogen and Seed Size on Maize Crop II: Yield and Yield Components

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ABSTRACT

A field study was conducted to sort out the nitrogen and seed sizes effects on yield and yield components of maize. Four seed sizes i.e. small, medium, large having diameter of 0.5, 0.6-0.7 and 0.8-1.0 cm, respectively and composite (not graded) and four doses of N i.e. 0, 60, 120 and 180 kg ha^{-1} were used in the experiment. Significantly maximum cobs plant^{-1} (1.5), 1000 grain weight (254.4 g), number of grains cob^{-1} (342.5) and grain yield (2479.16 kg ha^{-1}) was recorded with 120 N kg ha^{-1}. Large seed size gave maximum number of grains cob^{-1} (334.1), 1000 grain weight (243.3 g) and grain yield (2398.21 kg ha^{-1}) while non-significantly effect was recoded in number of cobs plant^{-1}. Thus it may be concluded that 120 N kg ha^{-1} and large seed size of maize showed best performance and is recommended for better performance in prevailing agro-climatic condition of Peshawar.

Key Words: Nitrogen; Seed sizes; Yield; Maize

INTRODUCTION

Maize can be cultivated both as spring and kharif crop. In Pakistan it is cultivated on area of 966.6 thousand hectares with the total annual production of 1731 thousand tones with an average yield of 1791 kg/ha (MINFAL, 2002). Although maize has a great yield potential yet its average yield in Pakistan is very low. The important factors responsible for this low yield are poor seed quality, non-judicious use of fertilizer, improper plant protection measure and non-availability of irrigation water. Quality seed plays an important role in germination and seedling vigor and ultimately grain yield. The increase in the size seed in maize can be achieved by managing nutrients like nitrogen (Eck, 1984). N increases growth rate of the seed during the filling period which may produce heavier seeds.

The present study on maize variety Kissan-92 was carried out with aim to determine the effect of seed sizes and nitrogen levels on the yield and yield components of maize.

MATERIALS AND METHODS

Four levels of N i.e. 0, 60, 120 and 180 kg ha^{-1} and four seed sizes i.e. small, medium and large sorted by sieving through diameters of 0.5, 0.6-0.7 and 0.8-1.0 cm, and composite (without sieving) were evaluated in RCB design with split plot arrangement replicated four times. Nitrogen was allotted to main and seed sizes to subplot. The maize variety Kissan-92 was used in the experiment.

Plants were sown in July 2002 in plot size of 5x3.5m having 5 rows 70 cm apart, with 20 cm plant to plant distance. The soil used in the experiment was a silty clay loam, well drained and strongly calcareous, with a pH of 8.2. It was deficient in nitrogen and phosphorous but has adequate potassium. Organic matter was less than 1%. Phosphorus at the rate of 60 kg/ha were applied as a basal dose. The data were recorded on Number of cobs per plant, Number of grains per cob, thousand grain weight and Grain yield.

RESULTS AND DISCUSSION

Number of cobs plant^{-1}. N levels significantly affected number of cobs per plant (Table I). Maximum number of 1.5 cobs plant^{-1} were recorded with 120 kg ha^{-1} N. Number of cobs increased with increase in N level up to 120 kg ha^{-1}. Seed size had no effect on number of cobs per plant.

Number of grains cob^{-1}. N significantly affected the number of grains per cob (Table II). Maximum number of grains per cob 342.5, were recorded with 120 kg ha^{-1} N followed by 309.9 with 60 kg ha^{-1} N. The other two doses had lower number of grains cob^{-1} and were at par statistically. The probable argument for this may be judicious nutrient and water to the plant to produce a cob of more grains and length. This is in similarity with Muhammad *et al*. (1993) who reported maximum number of grains cob^{-1} in plants applied with 100% of recommended N level (120 kg ha^{-1}). Significantly greater grains of 334.1

Table I. Number of cobs plant^{-1} as affected by different Nitrogen levels and seed sizes

Seed sizes	Nitrogen levels (kg ha^{-1})				Means
	0	60	120	180	
Small	1	1	1	1	1
Medium	1	1	1	1	1
Large	1	1	2	1	1.25
Composite	1	1	2	1	1
Mean	1 b	1 b	1.5 a	1 b	

LSD value at P≤0.05 for N levels = 0.20

Table II. Number of grains cob^{-1} as affected by different Nitrogen levels and seed sizes

Seed sizes	Nitrogen levels (kg ha^{-1})				Means
	0	60	120	180	
Small	276.2 ghi	287.6 fgh	307.6 def	284.0 ghi	288.9 c
Medium	285.2 gh	310.9 de	327.7 cd	263.7 i	296.9 bc
Large	294.5 efg	332.9 bc	384.7 a	324.2 cd	334.1 a
Composite	270.5 hi	308.5 def	349.9 b	278.8 ghi	301.9 b
Mean	281.6 c	309.9 b	342.5 a	287.6 c	

LSD value at P≤0.05 for N levels = 19.65； LSD value at P≤0.05 for seed sizes = 10.57； LSD value at P≤0.05 for interaction = 21.15； Means followed by one letter in common are not significantly different statistically

Table III. 1000 grain weight (g) as effected by different Nitrogen levels and seed sizes

Seed sizes	Nitrogen levels (kg ha^{-1})				Means
	0	60	120	180	
Small	186.25	223.75	228.50	240.50	219.75b
Medium	195.75	249.75	263.75	263.50	243.18a
Large	213.00	252.50	246.00	261.75	243.31a
Composite	206.00	248.25	260.50	251.75	241.62a
Mean	200.25b	243.56a	249.68a	254.37a	

LSD value at P≤0.05 for N levels = 13.15； LSD value at P≤0.05 for seed sizes = 9.795

Table IV. Grain yield (kg ha^{-1}) as effected by different Nitrogen levels and seed sizes

Seed sizes	Nitrogen levels (kg ha^{-1})				Means
	0	60	120	180	
Small	1476.17	2011.90	2142.85	2214.28	1961.30c
Medium	1654.76	2166.66	2476.18	2344.54	2160.53b
Large	1845.23	2380.95	2779.61	2569.04	2398.21a
Composite	1761.89	2178.57	2499.99	2392.85	2208.32b
Mean	1684.51c	2184.52b	2479.16a	2380.18a	

LSD value at P≤0.05 for N levels = 144.6; LSD value at P≤0.05 for seed sizes = 115.3; Means followed by one letter in common are not significantly different statistically at P≤0.05.

were recorded with large size seed while minimum grains of 288.9 were recorded with small size seed. Maximum number of grains cob^{-1} were investigated in 120 kg ha^{-1} N x large seed size with the argument of more judicious use of nutrient by plant.

1000 Grains weight. Nitrogen and seed size had significantly effect on 1000 grain weight (Table III). Controlled plots had significantly lower 1000 grain weight than where N was applied, while the maximum 1000 grain weight (254.37) recorded with 180 kg N ha^{-1}. These results are in line with Alam and Khan (1988) who reported maximum 1000 grain weight (248 g) with 200 kg ha^{-1} N dose. Significantly lighter 1000 grain weight (219.8 g) recorded with plots having small size may be due to weaker seedling and unproductive plants produced there of, which may have resulted in low grain weight.

Grain yield (kg ha^{-1}). Both N and seed size significantly affected grain yield (Table IV). Significantly minimum grain yield (1684 kg ha^{-1}) recorded with control plots might be due to limited supply of nitrogen at lower levels and partly due to higher mortality rate at zero nitrogen, while maximum grain yield (2479 kg ha^{-1}) was recorded with 120 at par. No further increase in grain yield adding more N fertilizer. Pandey *et al.* (1999) also reported maximum yield at 120 kg ha^{-1} nitrogen level. As regard seed size the maximum yield (2398 kg ha^{-1}) recorded with the bold seed might be due to the less mortality rate compared to small seed (1961 kg ha^{-1}). Earlier Galecic (1993) who reported that grain yield increases with increase in seed size.

CONCLUSIONS

On the basis of these observation, it may be concluded that nitrogen level 120 kg ha^{-1} and large seed size responded better in yield and other characteristics and may be recommended for higher productivity after testing for other characteristics under varied climatic condition and circumstances.

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