The effect of nitrogen fertilizer and plant population on growth and yield of minicorn

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The importance of nitrogen fertilizer and appropriate plant population to high maize yield is well documented for various cultural conditions. Higher plant populations are needed with early maturing cultiyars (1) with optimum yield depending on simultaneously increasing the supply of nitrogen (2). This paper reports on a the examination of nitrogen and plant population effects on growth and yield of a recently released very short season cultivar of maize (Minicorn).

Methods

Minicorn was planted to achieve plant populations (PP) of 30, 60, 90, 120, 150 x 10^3 plants ha-^{1} in factorial combination with nitrogen (N) at 0, 50, 100, 150 and 200 kg ha-1 replicated twice. The trial was located on a Tenthill soil with very low NO3-N (< 2 mg kg-1) and moderate NH4-N (11 mg kg^{-1}) levels to 90 cm. The trial was irrigated regularly and weeds and insects were controlled chemically. Data were collected on above ground dry matter at tasseling (DMT), leaf number (LN), cob weight (CW), cob grain yield (CY), indiyidual seed weight (SW), grain yield at 12% moisture (GY) and nitrogen content of whole plants at 30 cm (NP) and of grain (NG).

Results and discussion

Table 1 shows the significant (P = 0.05) effects on Minicorn of N and PP, and the direction of the response (t= increase, 4 = decrease).

Table 1. The effect of N and PP on Minicorn

	DMT (kg ha^{-1})	LN	CW (g)	CY (g)	SW (mg)	GY (t ha^{-1})	NP %	NG %
N effect	*↑	*↑	*↑	*↑	NSD	*↑	*↑	*↑
Value at 0 kg ha^{-1}	1 455	9	56.4	29.7		3.58	1.75	1.2
Maximum	2 868	11.7	100.6	54.1		7.04	2.6	1.5
PP effect	*↑	NSD	*↓	*↓	NSD	*↑	NSD	NSD
Value at 30 x 10^3 p/ha^{-1}	1 657		104.6	61.4		4.63		
Maximum/(Mininum)	2 797	(72.7)	(38.9)			8.0		

No interaction of N and PP occurred, in contrast to the data of Bunting (1978). Most of the response to N occurred at 50 kg N ha^{-1} (yield = 6.26 t h^{a-1}), probably due to the presence of moderate amounts of NH4-N in the profile, some of which would have nitrified or been taken up directly, and contributed to the relatively high control yield (3.58 t ha-^{1}). Regression of grain yield against N, N^2, PP, PP^2 and N x PP produced the predictive equation GY (t ha-1) = 2.66 + 1.5 x PP x 10-5 + 2.9 x N x PP x 10-7 (r2 = 0.81) after the elimination of non-significant terms. Optimum yield was achieyed with plant populations of around 90 x 10^3 plants ha-^{1}. In our trial, N at 150 kg ha-1 produced maximum yield, however, a higher or lower rate may be needed depending on soil N status.

1. Beech, D.F. and Basinski, J.J. (1975). Aust. J. Exp. Agric. Anim. Husb. 15: 406-413.

2. Bunting, E.S. (1978). In "Forage Maize", Ed. Bunting, E.S., ARC, London.