

Effect of nitrogen and plant population on yield and quality of super sweet corn (*Zea mays*)

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ABSTRACT

A field experiment was conducted under aegis of All-India Co-ordinated Maize Improvement Project, at Maize Research Station, Amberpet, Hyderabad, to study the effect of nitrogen levels and plant populations on the yield and quality of super sweet corn (*Zea mays* L.) var. 'Madhuri'. Increment in nitrogen levels (0-120 kg (N/ha) significantly increased the number of primes, yield attributes, green ear and kernel yield and decreased the number of non-primes. Raising of plant population (53,333 to 88,888 plants/ha) increased the number of primes, non-primes, green ear and kernel yield and decreased the yield attributes. Kernel quality was significantly affected by nitrogen levels, while population densities did not alter its quality.

Key words : N levels, Plant populations, Green ear, Green kernel yield

With advancement of science and technology, raise in standard of living, populist measures (supply of rice at subsidized rate) and supply of rice and wheat through public distribution system, there is a change in traditional usage of maize directly as food and increase in consumption of green ears as food, specially in and around cities and towns. The high-yielding varieties of maize (single, double and three-way cross hybrids) are not sweet and succulent and consequent to increased green ear demand, a sweet and succulent maize type ('Madhuri') has been developed. This is a

medium plant type and provides green ears by 65-75 days after sowing. As the new variety is medium plant type and harvested 45-55 days early to normal grain maize for green ears, there was need to workout a suitable nitrogen dose and optimum plant stand. There was also need to study the effect of these treatments on the green kernel quality and hence the present experiment was undertaken.

MATERIALS AND METHODS

The field trials were conducted during the winter seasons of 1994 and 1995 at Maize Research Station, Amberpet, Hyder-

abad, Andhra Pradesh. The experimental soil was sandy loam, with pH 7.9. It was medium in available nitrogen and phosphorus and high in potassium. The treatments consisted of 4 nitrogen levels (0, 40, 80 and 120 kg N/ha) as main plots and 3 plant populations (53,333; 66,666 and 88,888 plants/ha) with a spacing pattern of 75 cm $\times$ 25 cm, 75 cm $\times$ 20 cm and 75 cm $\times$ 15 cm, respectively in subplots were laid in split-plot design replicated 4 times. Half of nitrogen as per the treatment along with entire dose of phosphorus and potassium (@ 60 P_2O_5 and 30 K_2O kg/ha) was applied as basal dose and remaining half of nitrogen was top-dressed 30 days after sowing. All the other recommended package of practices for maize were followed. The green ears were harvested after milk stage and were graded into prime and non-prime categories based on their relative quality. Prime ears were distinguished as large, well formed, possessing desirable colour with out apparent quality defects. The green ear and kernel weight in the paper refers to the sum of the weights of primes and non-primes. Two years composite samples of green kernels were analysed for total sugars, reducing sugars, non-reducing sugars and proteins according to standard laid out procedures.

RESULTS AND DISCUSSION

Effect of nitrogen

Application of nitrogen significantly increased the number of primes, ear length, ear girth, green ear and kernel weight of super sweet corn, while the number of non-primes decreased (Table 1). Maximum mean green ear weight and kernel weight were recorded with 120 kg N/ha, owing to

improvement of yield attributes and hence the number of primes were maximum and the number of non-primes minimum. Such an effect of higher doses of applied nitrogen could be attributed to its favourable effect on cell enlargement in production of larger leaves and improving photosynthetic efficiency of plants. The present findings support the results of Raju *et al.* (1997) and Singh *et al.* (1997). Though the crop being harvested at 65–75 days after sowing (45–55 earlier to grain maize), response to nitrogen appears linear and hence 120 kg N/ha (level of nitrogen followed for grain maize) may be recommended to super sweet corn also.

The quality parameters of super sweet corn kernels, viz. total sugars, reducing sugars, non-reducing sugars and proteins improved with nitrogen application (Table 2). However significant difference among N levels was observed from 80 kg N/ha and there was no significant difference between 80 kg and 120 N/ha. Raja *et al.* (1989) also reported improvement in the quality of maize with nitrogen nutrition.

Effect of plant population

Increase in plant population levels significantly increased the number of primes, non-primes, green ear and kernel yield, but decreased the length and girth of the ears. The increased green ear and green kernel yield with higher plant populations were observed owing to more number of harvestable ears per unit area. However the better development of ear length and ear girth and lesser percentage of non-primes at lower plant density levels could not compensate the loss due to less number of harvestable

Table 1. Effect of nitrogen and population levels on yield attributes and yield of super sweet corn

Treatment	Non-primers (No./ha)		Primers (No./ha)		Ear length (cm)		Ear girth (cm)		Ear weight (q/ha)		Green kernel weight (q/ha)	
	1994	1995	1994	1995	1994	1995	1994	1995	1994	1995	1994	1995
<i>N (kg/ha)</i>												
N ₀	14,316	15,315	48,369	50,376	11.7	12.5	10.9	10.2	44.75	51.40	39.80	34.98
N ₄₀	10,532	11,175	53,559	56,031	14.2	15.2	13.2	13.9	72.91	81.50	56.97	63.28
N ₈₀	3,039	3,859	60,541	63,036	17.2	17.3	16.2	16.2	108.33	115.20	84.62	89.42
N ₁₂₀	1,958	1,194	63,886	65,639	18.5	18.4	17.4	17.7	120.08	129.11	94.45	100.20
CD (P=0.05)	612	1,766	1,565	1,727	0.8	0.8	0.7	1.1	10.42	7.75	8.16	5.96
<i>Population density (plants/ha)</i>												
53,333	3,652	3,984	45,981	47,926	16.4	17.1	15.4	15.2	71.83	79.88	56.72	62.33
66,666	8,394	9,057	53,404	55,405	15.4	15.6	14.4	14.5	84.08	91.04	66.38	71.02
88,888	10,339	10,916	70,381	72,980	13.7	14.9	13.5	13.8	104.16	111.95	80.12	86.18
CD (P = 0.05)	851	987	1,672	1,527	0.5	0.8	0.5	0.6	8.28	5.39	6.41	4.19

Table 2. Effect of nitrogen and population level on quality of sweet corn kernels (Mg/g dry weight)

Treatment	Total sugars	Non-Reducing sugars	Reducing sugars	Protein content (%)
<i>N kg/ha</i>				
N ₀	21.57	19.05	1.93	11.78
N ₄₀	23.08	19.76	2.16	14.91
N ₈₀	25.60	22.52	2.59	16.55
N ₁₂₀	26.56	23.53	2.90	16.83
CD (P = 0.05)	1.62	3.19	0.42	1.01
<i>Population density (plants/ha)</i>				
53,333	24.64	21.69	2.57	15.38
66,666	24.11	21.17	2.37	14.90
88,888	23.85	20.84	2.25	14.77
CD (P = 0.05)	NS	NS	0.22	NS

ears per unit area. Thus, in case of super sweet corn ('Madhuri'), being medium plant type, higher population of 88,888 plants/ha was found beneficial to obtain more number of cobs and higher green ear and kernel yield compared to normal plant stand of 66,666/ha adopted for grain corn. Esechie (1992) and Singh *et al.* (1997) also reported similar effects of plant populations on growth and yield of maize.

The quality of super sweet corn green kernels was unaffected by population densities excepting the reducing sugar which significantly reduced with increasing populations.

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