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RESEARCH PAPER

Effect of planting geometry and nitrogen levels on growth, green cob yield and economics of sweet corn (*Zea mays saccharata* Sturt.)

AARTI VERMA* **AND** G.S.TOMAR[1]
Krishi Vigyan Kendra (I.G.K.V.), BHATAPARA (C.G.) INDIA (Email : verma.aarti2503@gmail.com)

Abstract : A field experiment was conducted at the Instructional Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *Kharif* season of 2009. The sweet corn var. Sugar-75 was sown on July 7th 2009 using experimental techniques of Split Plot Design with three replications. Treatment comprised of three planting geometry *viz.*, 60 × 25cm (P_1), 60 x 20cm (P_2), 60 x 15cm (P_3) in main plots and 5 levels of nitrogen *viz.*, control (N_0), 40 (N_1), 80 (N_2), 120 (N_3), 150 (N_4), kg N ha^{-1} in sub plots. Results revealed that all the growth parameters were influenced significantly due to different planting geometries and levels of nitrogen. Wider plant spacing 60x25cm (P_1) produced maximum number of green leaves, stem girth, dry matter accumulation and crop growth rate which resulted in maximum green cob yield (9.65 t ha^{-1}) and higher net returns (Rs. 78,371 ha^{-1}) coupled with wider B:C ratio (3.33) as compared to other planting geometries. However, narrow plant spacing (60 × 15 cm was found to be superior in terms of number of cobs ha^{-1} (91.63 × 10^3), green fodder and stover yields. Application of nitrogen @ 120 kg N ha^{-1} was found to improve growth and yield attributes of sweet corn and consequently the higher green cob yield (10.23 t ha^{-1}). Wider plant geometry (60 × 25cm) in combination with 120 kg N ha^{-1} recorded maximum green cob yield (11.06 t ha^{-1}).

Key Words : Sweet corn, Planting geometry, Levels of nitrogen, Growth, Green cob yield

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INTRODUCTION

Sweet corn (*Zea mays saccharata* Sturt.), is a medium plant type and provides green ears in 65 to 80 days after sowing. Sweet corn is favorable for fresh consumption because of its delicious taste, delicate crust, soft and sugary texture compared to other corn varieties. At soft dough stage, sweet corn contains 12-15 per cent sugar, 10-11 per cent starch, 3 per cent water soluble polysaccharides and 70 per cent water, besides moderate levels of protein and vitamin A (yellow varieties) and potassium (Oktem and Oktem, 2005). At present the cultivation of sweet corn is concentrated in the outskirts of big cities and metropolis. In Chhattisgarh the uncertainty of rice in upland, especially in low rainfall areas lead the farmers to go for other alternative crops which give more remunerative returns. Under such circumstances, scope to grow sweet corn seems to be the better choice for upland farmers. In order to popularize its cultivation among the farming community, it is essential to standardise its agro-techniques not only for its potential yield but also for quality sweet corns. The recommended planting geometry and N levels for the hybrids and composits may not be applicable for sweet corn type. The present experiment was initiated to fill this gap.

MATERIAL AND METHODS

A field experiment was conducted at the Instructional Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.)

*** Author for correspondence**
[1]Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwa Vidyalaya, RAIPUR (C.G.) INDIA

during *Kharif* season of 2009. Raipur is located at 21°4' N latitude and 81°39' E longitude and at an altitude of 298 m above MSL The soils of the experimental plot was sandy loam in texture (*Inceptisol*) with pH 7.45, low in organic carbon (0.42 %), low in available N (184 kg ha^{-1}), available P (8.94 kg ha^{-1}) and K (307 kg ha^{-1}) contents. Temperature and other weather conditions remained favorable throughout the growing season of the crop.

The sweet corn var. Sugar-75 was sown on July 7th 2009 using experimental techniques of Split Plot Design with three replications. Treatment comprised of three planting geometry *viz.*, 60 × 25cm (P_1), 60 × 20cm (P_2), 60 × 15cm (P_3) in main plots and 5 levels of nitrogen *viz.*, control (N_0), 40 (N_1), 80 (N_2), 120 (N_3), 150 (N_4), kg N ha^{-1} in sub plots. Recommended agronomic practices were followed for raising sweet corn .The crop was harvested on 27th Sep. and 10th Oct., 2009 for green cobs and grain purpose, respectively.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Planting geometry :

Wider spacing (60 × 25 cm) accommodating 66,666 plants ha^{-1} (P_1) recorded significantly a minimum plant population and LAI over other geometries in all the stages of crop growth. Narrow geometry of 60 × 15 cm with 1,11,111 plants ha^{-1}(P_3) resulted in significantly maximum plant population and LAI at different stage of crop growth (Table 1). Competition among plants for solar radiation, nutrients and water in closer planting might be reason behind greater leaf area index of sweet corn. These results are in agreements with those of Sahoo and Mahapatra (2007) and Kumar (2008).

Wider plant spacing 60×25cm (P_1) produced maximum

Table 1: Growth attributes of sweet corn as influenced by planting geometry and levels of nitrogen

Treatments	Plant population (000 ha^{-1}) (At harvest)	Plant height (cm) (At harvest)	Number of green leaves plant^{-1} (At harvest)	Leaf area index (At harvest)	Stem girth (cm) (At harvest)	Crop growth rate (g plant^{-1} day^{-1}) (At harvest)	Dry matter accumulation (g plant^{-1}) (At harvest)
Planting geometry							
P_1-60 × 25 cm	63.08	126.97	15.81	2.59	5.13	5.83	157.54
P_2-60 × 20 cm	80.11	134.41	14.35	3.20	5.07	5.43	146.70
P_3-60 × 15 cm	108.12	144.15	13.26	3.72	4.68	5.32	143.85
S.E. ±	0.25	0.72	0.11	0.06	0.05	0.02	0.79
C.D. (P=0.05)	1.0	2.83	0.42	0.22	0.24	0.12	3.12
Levels of N (kg ha^{-1})							
N_o-Control	83.34	118.83	13.32	2.89	4.15	5.17	139.854
N_1-40	83.40	128.56	14.12	3.12	4.63	5.41	146.193
N_2-80	83.99	135.09	14.76	3.28	4.91	5.59	151.161
N_3-120	84.02	143.79	15.99	3.51	5.17	5.85	158.052
N_4-150	83.99	149.61	14.11	3.17	5.09	5.61	151.558
S.E. ±	0.26	0.75	0.28	0.07	0.05	0.02	0.57
C.D. (P=0.05)	NS	2.17	0.84	0.14	0.15	0.06	1.69

Table 2 : Number of green cobs, green cobs yield and green fodder yield of sweet corn as influenced by planting geometry and levels of nitrogen

Treatments	Number of green cobs (10^3 ha^{-1})	Green cob yield (tones ha^{-1})	Green fodder yield (tones ha^{-1})
Planting geometry			
P_1-60 × 25 cm	57.21	9.65	21.31
P_2-60 × 20 cm	72.00	8.83	22.92
P_3-60 × 15 cm	91.63	8.15	24.78
S.E. ±	0.31	0.16	0.35
C.D. (P=0.05)	1.25	0.64	1.40
Levels of N (kg ha^{-1})			
N_o-Control	67.02	7.51	20.35
N_1-40	70.48	8.22	20.19
N_2-80	74.58	9.02	22.75
N_3-120	77.83	10.23	24.64
N_4-150	78.17	9.40	27.08
S.E. ±	0.29	0.13	0.32
C.D. (P=0.05)	0.85	0.40	0.94

Table 3 : Cost of production , gross and net returns and benefit :cost ratio of sweet corn as influenced by planting geometry and levels of nitrogen

Treatments	Cost of cultivation (Rs ha^{-1})	Gross return (Rs ha^{-1})	Net return (Rs ha^{-1})	B:C ratio
Planting geometry				
P_1: 60 cm × 25 cm	23436.3	101808	78371	3.33
P_2: 60 cm × 20 cm	25836.3	94032	68195	2.63
P_3: 60 cm × 15 cm	28236.3	87715	59479	2.09
S.E. ±	–	1946.27	2771.81	0.07
C.D. (P=0.05)	–	4017.12	5721.03	0.16
Levels of N (kg ha^{-1})				
N_0 – Control	24993.9	80187	55193	2.24
N_1 – 40	25425.9	87280	61854	2.47
N_2 – 80	25857.9	95925	70067	2.75
N_3 -120	26289.9	108460	82170	3.16
N_4 -150	26613.9	100738	74124	2.81
S.E. ±	–	2300.94	3073.416	0.09
C.D. (P=0.05)	–	5630.42	7520.65	0.24

number of green leaves, stem girth, dry matter accumulation and crop growth rate which resulted in maximum green cob yield (9.65 t ha^{-1}) as compared to other planting geometries, which might be due to low plant canopy and favorable environment at the initial stage of crop growth (Table 2). Similar results have been reported by Gollar and Patil (2000) at Dharwad and Muniswamy and Gowda (2007). But the more number of cob ha^{-1} under close spacing might be due to the greater planting density per unit area. The results are in agreement with that of Raja (2001).

A wider planting geometry of 60 × 25 cm (P_1) continued to maintain its superiority in terms of higher net returns (Rs. 78,371 ha^{-1}) coupled with wider B:C ratio (3.33) (Table 3). The handsome net realization in P_1 was attributed due to higher green cobs yield and lower cost of sweet corn production. The results collasborate with the findings of Kumar (2008).

Nitrogen levels :

Application of nitrogen @ 120 kg N ha^{-1} was found to improve all the growth parameters like maximum plant population, LAI number of green leaves, stem girth, dry matter accumulation and crop growth rate and yield attributes of sweet corn and consequently the higher green cob yield (10.23 t ha^{-1}) (Table 1 and 2). Due to increasing level of nitrogen as it increases cell division, cell elongation and nucleus formation. These findings are in close conformity with those of Bindhani *et al*. (2007). But the maximum number of green cobs (78.17 × 10^3) were produced at 150 kg N ha^{-1} (N_4), but it stood at par with the number of cobs (77.83 × 10^3) obtained at 120 kg N ha^{-1} (N_3) and both of these treatments resulted significantly higher number of cobs ha^{-1} over preceding levels of N applications. Wider plant geometry (60 × 25cm) in combination with 120 kg N ha^{-1} recorded maximum green co b yield (11.06 t ha^{-1}).

With respect to the effect of different levels of nitrogen, the cost of sweet corn produced increased with the each level of N application, highest cost of Rs. 26613 $ha^{-1}$was involved with the highest level of N application (Table 3). While increasing levels of N application improved the net realization and profit per rupee invested in the production of sweet corn. It is pertinent to note that the net profits (Rs. 82,170 ha^{-1}) coupled with a B:C ratio of 3.16 accrued with the application of 120 kg N ha^{-1} (N_3) was substantially higher than the production cost as well as proved significantly superior over other lower levels of N. These findings are in line with Suryavanshi *et al*.(2008).

Conclusion :

The result concluded that sweet corn planted with wider geometry (60 × 25 cm) resulted in maximum green cob yields and net profits, while closer geometry (60 × 15 cm) produced more number of green cobs ha^{-1}. Application of nitrogen at 120 kg N ha^{-1} was proved to be beneficial in terms of green cob production, and net profits of sweet corn.

REFERENCES

Bindhani, A., Barik, K.C., Garnayak, L.M. and Mahapatra, P.K. (2007). Nitrogen management in Baby corn (*Zea mays*). *Indian J. Agron.,* **52**(2) : 135-138.

Gollar, R.G. and Patil, V.C. (2000). Effect of plant density on growth and yield of maize genotypes during *Rabi* season. *Karnataka J. Agric. Sci*., **13**(10) :1-6.

Kumar, A. (2008). Productivity, economics and nitrogen-use-efficiency of specially corn (*Zea mays*) as influenced by planting density and nitrogen fertilization. *Indian J. Agron.,* **53**(4) : 306-309.

Muniswamy, S. and Gowda, R. (2007). Effect of spacing and nitrogen levels on seed yield and quality of maize single cross hybrid PEMH-2. *Mysore J. agric. Sci.,* **41**(2) : 186-190.

Oktem, A. and Oktem, A. (2005). Effect of nitrogen and intra row spaces on sweet corn (*Zea mays Sachharata* Sturt.) ear characteristics. *Indian J. Plant Sci.,* **4**(4) : 361-364.

Raja, V. (2001). Effect of nitrogen and plant population on yield and quality of super sweet corn. (*Zea mays*). *Indian J. Agron.,* **46**(2): 246-249.

Sahoo, S.C. and Mahapatra, P.K. (2007). Response of sweet corn (*Zea mays* L.) to nitrogen levels and plant population. *Indian J. agric. Sci.,* **74**(6) : 337-338.

Suryavanshi, V.P., Chavan, B.N., Jadhav, K.T. and Pagar, P.A. (2008). Effect of spacing, nitrogen and phosphorus levels on growth, yield and economics of *Kharif* maize. *Internat. J. Trop. Agric.,* **26**(3): 287-290.

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