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Sonali Biswas
Assistant Professor,
AICRP on Maize, Directorate of Research, BCKV, Kalyani, Nadia, West Bengal, India

Abhijit Saha
Assistant Professor, College of Agriculture, Lembucherra, West Tripura, Tripura, India

Srabani Debnath
Assistant Professor,
AICRP on Maize, Directorate of Research, BCKV, Kalyani, Nadia, West Bengal, India

Soumitra Chatterjee
Assistant Professor, AICRP on IFSR, Directorate of Research, BCKV, Kalyani, Nadia, West Bengal, India

Correspondence
Sonali Biswas
Assistant Professor, AICRP on Maize, Directorate of Research, BCKV, Kalyani, Nadia, West Bengal, India

Performance of sweet corn genotypes in *Kharif* under different planting density and nutrient levels in new alluvial zone of West Bengal

Sonali Biswas, Abhijit Saha, Srabani Debnath and Soumitra Chatterjee

Abstract
A field experiment was conducted at District Seed farm, Kalyani, Nadia, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India during *kharif* season of 2017 to study the response of sweet corn genotypes to different planting density and nutrient levels. The experimental results showed that higher density planting (83,000 plant ha^{-1}) recorded significantly highest plant height, green fodder yield, cob yield, net return and B: C ratio of crop. Among the different nutrient levels, higher nutrient level (200:60:80 kg NPK ha^{-1}) was recorded significantly higher green fodder yield, cob yield and total soluble solids (%) content by crop as compared to other treatments. The genotype AKSH4 gave significantly higher green fodder yield, cob yield, plant height, net return, B: C ratio and total soluble solids (%) content than the check varieties. Therefore from the above results, it can be concluded that cultivation of sweet corn genotype AKSH4 with planting density of 83,000 plants ha $^{-1}$ and nutrient level of 200:60:80 N, P and K kg ha^{-1} is a recommendable option for sweet corn.

Keywords: Sweet corn, planting density, genotypes, nutrient levels and yield

Introduction
Sweet corn (*Zea mays* L. Saccharata) also known as sugar corn is a hybridized variety of maize (*Zea mays* L.) specifically bred to increase the sugar content. The fruit of this plant is the corn kernel which has a sugary rather than a starchy endosperm and a creamy texture. In India, sweet corn (*Zea mays* L. Saccharata) is confined to meagre area by both farmers and private sectors to meet the demand of industries. Lack of knowledge in its usage, economic importance, non-availability of appropriate production technology (like optimum spacing and nutrient management) is the major constraints for its popularization among Indian growers. The net income from this crop is quite higher compared to grain maize (Khadtare *et al*., 2006) [3]. The optimum plant density is an important factor for intercepting sunlight for harvesting maximum solar radiation and higher photosynthesis besides, efficient use of plant nutrients and soil water. Maize is more affected by variations in plant density than other member of the grass family (Vega *et al*., 2001) [8]. Low soil fertility is one of the bottlenecks to sustain agricultural production and productivity (Negassa *et al*., 2007) [5]. Optimizing the NPK fertilizer doses is necessary to achieve optimal yield potential of cultivars. Hence, the present experiment was conducted to study the performance of sweet corn genotypes to different planting density and NPK levels.

Materials and Methods
Field experiment was conducted at District Seed farm, Kalyani, Nadia, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India during *kharif* season of 2017 to study the response of four sweet corn genotypes to different planting density and nutrient levels on growth, yield and economics of genotypes. The soil of the experimental field was alluvial having silty clay loam in texture, pH neutral in reaction (7.2) and medium in organic carbon content (0.52 %). The experiment was laid out in split-split plot design with two planting densities (66,000 plant ha^{-1} and 83,000 plant ha^{-1}) in main plots, two nutrient levels (150:50:60 and 200:60:80 kg NPK ha^{-1}) in subplots, four genotypes [AKSH4, Mathuri Sweet corn, Priya sweet Corn and W0SC] in sub-sub plots having three replications. The crop was planted in 7th July, 2017. Urea, single super phosphate and muriate of potash were the fertilizers used. Out of these 50% nitrogen, 100% phosphorus and potassium were applied as basal and remaining 50% nitrogen was split

first at knee height and at tasseling stage. The observations on plant height, cobs per hectare, grain yield, stover yield and total soluble solid were recorded. The statistical analysis was done as per procedure suggested by Gomez and Gomez (1984).

Results and Discussion

Growth, yield attributes and yield as affected by plant density, nutrient levels and maize genotypes

Experimental results revealed that growth, yield attributes and yield were significantly influenced by planting density and nutrient levels of sweet corn genotypes. The interaction effect was not significant. Among the planting density, highest plant height (205.7 cm) was recorded in higher density planting (83,000 plant ha^{-1}). Increase in plant height at higher plant density might be due to overcrowding and competition for light resulting in taller plants at higher plant density. As the mutual shading increased at high plant density, the plants tended to grow taller. These findings are in close conformity with those of Pal and Bhatnagar (2010) and Mohseni *et al*. (2013) [4]. No significant effect was observed on plant height with respect to nutrient levels. In respect of genotypes, AKSH4 gave higher plant height (212.4 cm) at harvest than other genotypes. Genotypic character of different genotypes might have attributed difference in plant height in this investigation.

Number of cobs ha^{-1} was not significantly influenced by different plant density. Higher nutrient levels (200:60:80 kg NPK ha^{-1}) recorded higher number of cobs ha^{-1} which was statistically similar to 150:50:60 kg NPK ha^{-1}. Genotype AKSH4 obtained maximum number of cobs ha^{-1} (73.7 000 ha^{-1}) which was statistically similar to genotype WOSC (73.1 000 ha^{-1}).

Green fodder yield was not significantly influenced by different treatments (Table-1). Cob yield was significantly influenced by planting density (Table-1). Higher planting density (83,000 plant ha^{-1}) recorded highest cob yield (12,131 kg ha^{-1}). The positive relationship between cob yield and plant density was due to the high number of ears harvested and high number of plants per unit area, though yield $plant^{-1}$ was high in lower plant density due to better interception of sun light, higher radiation and nutrients use efficiency (Dawadi and Sah, 2012) [2]. Maximum cob yield (11,416 kg ha^{-1}) was observed in higher nutrient levels (200:60:80 kg NPK ha^{-1}). Higher yield under higher level of nutrient might be accounted for their favourable influence on the better crop growth and yield attributes. Among the genotypes, AKSH4 showed maximum cob yield i.e. 12,033 kg ha^{-1} followed by best check WOSC which recorded cob yield of 10,445 kg ha^{-1}. Higher yield of maize realized from genotype AKSH4 might be due to its genetic make-up. Genotypic variations in yield were also reported by Patil *et al*. (2000) [7], and Ahmad *et al*. (2010) [1].

Total soluble solids as affected by plant density, nutrient levels and maize genotypes

Total soluble solids (%) was not significantly varied due to different planting density and nutrient levels (Table-1). Genotypes AKSH 4 recorded higher total soluble solids (10.9 %) than the others genotypes, might be due to its genetic make-up.

Gross return and B: C ratio as affected by plant density, nutrient levels and maize genotypes

In respect of economies, higher planting density (83,000 plant ha^{-1}) recorded highest net return (74726/-) and B: C ratio (2.12) of sweet corn. This might be due to higher green fodder yield and cob yield under higher plant density that led more B: C ratio and crop productivity. Higher nutrient levels produced higher gross return (69402 /-) and B: C ratio (2.02) than lower nutrient levels. Genotypes AKSH4 recorded maximum gross return (75718/-) and B: C ratio (2.14) than other genotypes. This might be due to the fact that this genotype having greater potential to produce more green fodder and cob yield resulting in greater return amongst other genotypes.

Table 1: Performance of sweet corn genotypes in *Kharif* under varying planting density and nutrients levels

Treatments	Cobs ('000/ha)	Plant Height (cm)	Green Fodder Yield (Kg/ha)	Cob Yield (Kg/ha)	Net returns (Rs./ha)	B:C ratio	Total Soluble solids (%)
Density (plant ha^{-1})							
66,000	63.9	194.7	12171	8979	44238	1.65	10.5
83,000	81.1	205.7	14476	12131	74726	2.12	10.8
CD (p=0.05)	2.8	2.0	NS	1725.6	27150.6	0.4	NS
Nutrient Levels (kg ha^{-1})							
150:50:60	72.1	200.0	12337	9694	49562	1.76	10.4
200:60:80	72.9	200.4	14311	11416	69402	2.02	10.5
CD (p=0.05)	0.7	NS	NS	1701.0	5023.8	0.23	NS
Genotypes							
AKSH4	73.7	212.4	15096	12033	75718	2.14	10.9
Madhuri Sweet Corn	71.7	192.0	12787	10355	56743	1.83	10.5
Priya Sweet Corn	71.5	195.7	13092	9388	48541	1.73	10.4
WOSC	73.1	200.6	12320	10445	56925	1.86	10.4
CD (p=0.05)	1.6	NS	NS	1719.3	6578.8	0.3	0.2

Conclusion

From the experimental results, it can be concluded that, cultivation of maize genotype AKSH 4 with planting density of 83,000 plants ha^{-1} and nutrient level of 200:60:80 N, P_2O_5 and K_2O kg ha^{-1} is a recommendable option for achieving higher yield and economic benefit during *kharif* season under alluvial zone of West Bengal.

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