



Effect of plant geometry on growth and yield of *Zaid* sweet corn (*Zea mays*) varieties

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Abstract

This experiment was carried out during *zaid* season of 2020 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (India) to evaluate the effect of plant geometry on growth and yield of *zaid* sweet corn varieties. The experiment consisted of 9 treatments which included three varieties of sweet corn (Sugar-75, Sweet Glory and Hybrid Indam-Suruchi) used with three different spacing (45 cm x 15cm, 50 cm x 15 cm and 55 cm x 15 cm). The result revealed that maximum plant height (112.63 cm), leaves per plant (12.07), plant dry weight (96.7 g/plant), no. of cobs/ plant (1.17) and cob yield (10.06 t/ha) recorded on 55 cm x 15 cm + Sugar -75 and maximum straw yield (14.53 t/ha) recorded on 50 cm x 15 cm + Sugar -75.

Keywords: sweet corn, varieties and spacing

Introduction

Sweet corn (*Zea mays var. saccharate*) also known as sugar corn pole corn is a variety of maize with high sugar content. It is one of the most widely grown cereals in the world and has great significance as human food, animal food and raw materials for large number of industrial products. It is becoming more popular in India and other Asian countries because it varies from other corns (Field maize, pop-corn and ornamental) with higher level of sugar content in early dough stage.

It is consumed in the immature stage of the crop. The kernels of sweet corn taste considerably sweeter than normal corn, especially at 25-30% maturity (Naik, 2019) [5]. In India, maize is cultivated in an area of 9.63 million ha with grain production of 25.89 million tonnes and productivity of 2689 kg/ha (www.indiastat.com) (2016-2017). From this, about 50-55% of the total maize consumed for the food, 30-35% goes for poultry, piggery and fish meal industry and 10-12% to wet milling industry (Thakur, 2015) [9, 10].

Since there is a bound scope to enlarge the area under maize cultivation because of competition from other cereals and commercial crops, the only alternative is through enhancement of productivity by various management factors. In order to achieve higher cob yields, maintenance of plant density is the most important factor. A spatial arrangement of plant governs the shape and size of the leaf area per plant, which in turn influences efficient interception of radiant energy, proliferation, growth of roots and their activity. Maximum yield can be expected only when plant population allows individual plant to achieve their maximum inherent potential. Thus, there is need to work out an optimum population density by adjusting inter and intra row spacing in relation to other agronomic factors (Naik, 2019) [5].

Materials and Methods

This experiment was carried out during *zaid* season of 2020 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (India). The soil was sandy loam in texture, low in organic carbon (0.47%). Available Phosphorus 11 kg/ha and potassium 233 kg/ha (Bouyoucos, 1927; Olsen *et al.*, 1954 and Toth and Prince, 1949). The experiment was laid out in Randomised Block Design (RBD) with 9 treatments and replicated thrice. Three varieties of sweet corn (Sugar-75, Sweet Glory and Hybrid Indam-Suruchi) used with three different spacing (45 cm x 15cm, 50 cm x 15 cm and 55 cm x 15 cm).

Plant height (cm), number of leaves per plant and plant dry weight (g/plant) recorded as growth parameters and number of cobs per plant, cob yield (t/ha) and straw yield (t/ha) recorded as yield parameters at harvest.

Result and Discussion

Growth Parameters

At harvest, maximum plant height (112.63 cm) and plant dry weight (96.7 g/plant) was recorded on 55cm X 15cm + Sugar - 50cm X 15cm + Sugar -75 (111.87 cm & 95.5 g/plant). Maximum plant 75, which was significantly superior over all the treatment except height was due to wider spacing which helps in efficient utilization of natural resources like solar radiation, moisture and nutrients. This help in high photosynthesis activity leading to better growth. Similar findings were also reported by Thakur *et al.* (2000) [9, 10].

The production of more dry matter per plant might be due to wider spacing and better crop geometry which might have helped in utilizing the natural resources *viz.*, light, nutrients and soil

moisture more efficiently which may convert into organic constituents. Similar findings were also reported by Chougale (2003) [2]; Sukanya *et al.* 2000 [8]; Thavaprakash *et al.* (2005) [11]; Kar *et al.* (2006). Maximum number of leaves/plant recorded with 55 cm x 15 cm + Sugar -75 (12.07) which was statistically at par with 50 cm x 15 cm + Sugar -75 (11.93) and 55 cm x 15 cm + Sweet Glory (11.73). Crop geometry is one of the factors for higher production as it determines the plant population of a crop. Similar findings were also reported by Chougale (2003) [2] and Thavaprakash *et al.*, (2005) [11].

Yield Parameters

Maximum number of cobs per plant recorded at 55 cm x 15 cm + Sugar -75 (1.17), which was significantly superior over all the treatments. Significant and highest cob yield (10.32 t/ha) was observed under 50 cm x 15 cm + Sugar -75, however, 55 x 15 + Sugar -75 (10.06) were found to be statistically on par with 50 x

15 + Sugar -75 (10.32 t/ha). The plant spacing had significant influence of cob yield. The increase in the yield recorded in this investigation could be a reflection of the effect of plant geometry and variety.

The yield was higher due to increase in the spacing and hence increase in the photosynthetic activity, which could lead to increase in photosynthesis, resulting in greater transfer of assimilates to the cob and causing increase in their yield. These results are conformity with. Sahoo and Panda (1999) [7]; Khan *et al.* (2002) [4] Thavaprakash *et al.*, (2005) [11]; Chandekar *et al.* (2005) this might due to more plant population at 60 cm x 20 cm spacing which resulted in higher green cob and fodder yield. Highest straw yield (2.85 t/ha) was recorded with 50 cm x 15 cm + Sugar -75. The increase in cob and straw yield due to plant geometry is a clear reflection of increase in growth and yield attributes as the spacing helps in better dry matter partitioning, increase net photo-synthesis.

Table 1: Effect of Plant Geometry on Growth and Yield Parameters of Sweet Corn

Treatment	Plant height (cm)	Leaves/plant (no.)	Plant Dry Weight (g/plant)	No. of cobs/plant (no.)	cob yield (t/ha)	Straw yield (t/ha)
45 cm x 15 cm + Sugar -75	108.67	10.4	90.43	1.03	8.8	12.33
50 cm x 15 cm + Sugar -75	111.87	11.93	95.5	1.11	10.32	14.53
55 cm x 15 cm + Sugar -75	112.63	12.07	96.7	1.17	10.06	14.23
45 cm x 15 cm + Sweet Glory	106.9	9.73	90.37	1.04	8.76	12.17
50 cm x 15 cm + Sweet Glory	107.23	11.2	93.7	1.05	9.9	14.03
55 cm x 15 cm + Sweet Glory	109.73	11.73	94.07	1.07	9.69	13.7
45 cm x 15 cm + F ₁ - Hybrid Indam-Suruchi	106.23	9.73	89.7	1.03	8.69	12.1
50 cm x 15 cm + F ₁ - Hybrid Indam-Suruchi	108	10.73	92.1	1.03	9.36	13.37
55 cm x 15 cm + F ₁ - Hybrid Indam-Suruchi	108.3	11.4	93.37	1.04	9.2	12.83
Sem ±	0.61	0.14	0.47	0.008	0.05	0.11
CD (P=0.05)	1.82	0.42	1.4	0.023	0.26	0.34

Conclusion

55 cm x 15 cm + Sugar -75 recorded maximum growth and yield in sweet corn under Prayagraj climatic condition.

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