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Effect of Plant Geometry on the Economics of Sweet Corn (*Zea mays*) Varieties in Prayagraj Climatic Condition

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ABSTRACT

An experiment was carried out during *zaid* season of 2020 at Crop Research Farm, NAI, SHUATS, Prayagraj (India) to the effect of plant geometry on the economics of sweet corn varieties in Prayagraj climatic condition. The experiment consisted of 9 treatments which includes three varieties of sweet corn (Sugar-75, Sweet Glory and Hybrid Indam-Suruchi) used with three different spacing (45 cm × 15 cm, 50 cm × 15 cm and 55 cm × 15 cm). The result revealed that, treatment 55 cm × 15 cm + Sugar -75 recorded maximum plant height (112.63 cm), no. of cobs/plant (1.17), cob yield (10.06 t/ha) and B:C ratio (2.07), whereas maximum stover yield was recorded with treatment 50 × 15 + Sugar -75 (2.85 t/ha) and net return (INR 90.56 × 10^3/ha).

Keywords: Sweet corn, Varieties, Yield, Economics, spacing and economics

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 his 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 vary 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 considerable sweeter than normal corn, especially at 25-30% maturity (Naik, 2019). 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).

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).

MATERIALS AND METHODS

This experiment was carried out during *zaid* season

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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 × 15 cm, 50 cm × 15 cm and 55 cm × 15 cm).

Here we justified the economic importance of sweet corn on the basis of plant geometry. Plant height (cm), no. of cobs per plant (no.), cob yield (t/ha), straw yield (t/ha) recorded at harvest. Also observed the net returns (INR) and B:C ratio.

Through the formula

Net return = Gross return – Cost of cultivation

B: C ratio = (Net return/ Cost of cultivation) × 100

RESULTS AND DISCUSSION

Plant height

Maximum plant height was recorded on 55 cm × 15 cm + Sugar -75 (112.63 cm), which was significantly at par with 50 cm × 15 cm + Sugar -75 (111.87 cm). The plant height at harvest was influenced significantly due to different spacing. Highest plant height in treatment 55 × 15 + Sugar -75 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). Reduction in plant growth with increased inter row spacing and decreased intra row spacing seems to be the resultant of mutual shading due to overcrowding of plants, which might have reduced the availability of light within the crop canopy and inhibited elongation of lower internodes (Sahoo and Mahapatra, 2007).

No. of cobs/ plant

Maximum no. of cobs per plant was recorded on 55 cm × 15 cm + Sugar -75 (1.17), which was significantly superior over all the treatments. Higher no. of cobs due to more nutrients and the basis of variety. The results are in conformity with that of; Dangariya *et al.* (2011); Sahoo and Mahapatra (2004); and Kar *et al.* (2006).

Cob yield

Significant and highest cob yield (10.32 t/ha) was observed under 50 × 15 + Sugar -75, however, 55 cm × 15 cm + Sugar -75 (10.06 t/ha) were found to be statistically on par with 50 cm × 15 cm + Sugar -75. The plant spacing had significant influence of cob yield. The increase in the yield recorded in this

Table 1: Effect of plant geometry on sweet corn varieties

Treatment	Plant height (cm)	No. of cobs/ plant (no.)	Cob Yield (t/ha)	Straw yield (t/ha)	Net returns (× 10^3 INR/ha)	B:C ratio
45cm × 15cm + Sugar -75	108.67	1.03	8.8	12.33	68.67	01:01.5
50 cm × 15 cm + Sugar -75	111.87	1.11	10.32	14.53	90.56	01:02.0
55 cm × 15 cm + Sugar -75	112.63	1.17	10.06	14.23	89.01	01:02.1
45 cm × 15 cm + Sweet Glory	106.9	1.04	8.76	12.17	68.02	01:01.4
50 cm × 15 cm + Sweet Glory	107.23	1.05	9.9	14.03	85.12	01:01.9
55 cm × 15 cm + Sweet Glory	109.73	1.07	9.69	13.7	84.15	01:01.9
45 cm × 15 cm + F_1- Hybrid Indam-Suruchi	106.23	1.03	8.69	12.1	67.21	01:01.4
50 cm × 15 cm + F_1- Hybrid Indam-Suruchi	108	1.03	9.36	13.37	78.07	01:01.7
55 cm × 15 cm + F_1- Hybrid Indam-Suruchi	108.3	1.04	9.2	12.83	77.57	01:01.8
Sem ±	0.61	0.01	0.05	0.11	—	—
CD (P=0.05)	1.82	0.02	0.26	0.34	—	—

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); Khan *et al.* (2002), Thavaprakaash *et al.* (2005); Chandenkar *et al.* (2005); this might due to more plant population at 60 cm × 20 cm spacing which resulted in higher green cob and fodder yield Raja (2001).

Straw yield

Highest straw yield (2.85 t/ha) was recorded with 50 × 15 + 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 photosynthesis.

Economics

Significantly higher net return (INR 90.56 × 10^3/ha) was recorded in treatment 50 cm × 15 cm + Sugar -75 because of minimum cost of cultivation, whereas highest benefit cost ratio (2.07) was recorded under treatment 55 cm × 15 cm + Sugar -75.

CONCLUSION

Treatment 50 cm × 15 cm + Sugar -75 was found highest economic value in sweet corn under Uttar Pradesh climatic condition, whereas treatment 55 cm × 15 cm + Sugar -75 found highest benefit cost ratio.

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