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Effect of plant geometry and nitrogen levels on yield and economics of sweet corn (*Zea mays*)

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Abstract
The field experiment was conducted during *kharif* season, 2020 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The experiment was laid out in Randomized Block Design with nine treatments replicated thrice with the different spacing (60×15cm, 45×20cm and 30×30cm), with different combination of treatments as follows 90kg/ha, 100kg/ha, 120kg/ha of Nitrogen, Application of nitrogen levels with spacing significantly influenced the yield and economics. Gree cob yield (t/ha), stover yield(y/ha) was recorded significantly higher in treatment with, 45×20cm+120kh/ha. The maximum gross returns (12666344₹/ha). Net returns (101700₹ /ha) and B: Cratio (2:00) is recorded in treatment with 45×20cm+120kg/ha.

Keywords: Spacing, nitrogen levels, economics

Introduction
Maize belongs to a family poaceae is an important cereal food grain crop of the world which is being Grown in more than 166 countries across the globe including tropical, sub tropical and temperate regions, there is no any other cereal on the Earth, which has so immense yield potential so that maize and hence ccupied a place of "queen of cereals. It serves as basic raw material, and in gradient to thousands of industrial products that include starch oil, protein, alcoholic beverages, Food sweeteners, cosmetic film, textile gum, package, paper industries etc. Maize is third most important cereal crop after Rice and wheat, in human diet. In india it grown on 8.71 m ha area with 21 metres production. In 2014-2015 and productivity is 2552kg/ha. However in Madhya Pradesh it is grown in 0.85 m ha area with about 1.51mt of production and 1776kg/ha productivity.

So, it is grown for consuming immature kernels and harvest(at milky stage).It provides green cob in 75-80 days after sowing and harvested earlier by 35 to45 days compared to normal grain maize. It has great market potential and high market value in India (Sahoo and Mahapatra, 2007) [9]. In central India people consume sizeable quantity of green cob, which generates potential for sweet corn cultivation in the area. The plant growth involves various environmental and agronomical factors such as water, temperature, light, nutrients, Liu *et al.* (2004) [6], Yadav (2008) [15] and Yuan *et al.* (2003) [14]. The nitrogen is a vital nutrient for the activity of plant organs. It is a fraction of many components such as; amino acids, nucleic acids, chlorophyll and etc. Thus, plant growth can be affected by the amount of nitrogen, Najam *et al.* (2012) and Taiz and Zeiger (2002) [12].

Previous studies have shown that nitrogen fertilizer can increase the growth characterstics, such as; plant height, shoot dry matter and leaf area index (LAI), Sincik *et al.* (2008) [10], Maize crop differs in its ability to maintain LAI, CGR and above dry matter production at different levels of N application, Pandey *et al.* (2000) [8]. The optimum plant population and nitrogen needs to be standardized for this crop. The main reason for poor productivity of sweet corn is non availability of suitable production technology. Although, the agronomic requirement like optimum plant population and nitrogen (Kumar, 2009) [5] for maize crop has been worked out but the recommended plant spacing and nitrogen dose for hybrid and composites of maize may not be applicable for sweet corn. Sweet corn (*Zea mays*) grows successfully for vegetable purpose in different countries like USA Canada, Thailand and Sri Lanka etc. In India its cultivation is popular in Haryana, Maharashtra, Meghalaya, and Andhra Pradesh. The term "sweet corn" is a commonly used by food industry. It contains carbohydrate 19g sugar 3.3 g, dietary fibre 2.7 g fat 1.2g, protein 3.2 g, vitamin A10 the higher content of water soluble polysaccharides in the kernel add texture and improves quality in addition to

sweetness (Venkatesh *et al*, 2003) [13]. It is species of maize however, it differs from all other species of corn because it contains and retains a High amount of sugar in kernels. Since the kernels of sweet corn accumulate two to three times more sugar in the endo sperm than normal starchy maize (Doehlert and Kuo, 1993) [3].

Materials and Methods

The experiment was carried out in kharif season of 2020 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P). Which is located ar 25° 57N latitude, 87° 50 E longitude and at an altitude of 98 metre above the mean sea level. The soil of the experimental plot was sandy loam in texture 92.00kg, nearly neutral in soil reaction (PH,7.3), low in organic carbon(57%) medium in available N (230kg/ha),high available P(32.10kg/ha),and low in available K(346kg/ha).The seeds of sweet corn (*Zea mays*) variety' sugar 75' were sown on 1 st August 2020, with seed rate 10-11kg/ha and sown at 4-5cm depth. Recommended.

The experiment was laid out Randomized Block design comprised of 3 replications and total 9 treatments *viz*. treatment 1 (spacing 60×15cm + 90kg/Nha), Treatment 2 (spacing 60×15cm + 100kg/Nha) Treatment 3 (spacing 60×15cm + 120kg/Nha), Treatment 4 (spacing 45×20cm + 90kg/Nha) Treatment 5 (spacing 45×20cm + 100kg/Nha), Treatment 6 (spacing 45×20cm + 120kg/Nha), Treatment 7 (spacing 30cm×30cm + 90kg/Nha), Treatment 8 (spacing 30×30cm + 100kg/Nha), Treatment 9 (spacing 30×30cm + 120kg/Nha).

Results and Discussion

Effect of plant geometry and nitrogen levels on yield.

Effect of plant geometry and nitrogen levels on sweet corn are presented table 1:in the results 45× 20 cm+ 120 kg/ha which significantly superior over rest of treatments and treatment with application of 45×20cm+100kg/N/ha and 60×15cm+120kg/ha were stastically at par with45×20cm+100kgN/ha. The highest stover yield of sweet corn (4.78t/ha) was obtained with application 0f 45×20cm+120kg /N/ha which was significantly superior over rest of treatment with application of 45×20cm+100kgN/ha and 60×15cm+120kgN/ha were stastically at par with 45×20cm+120kg/N/ha. Hussain (2014) reported that higher dose of fertilizer application resulted increases the fodder yield.

Effect of plant geometry and nitrogen levels on economics

Effect of plant geometry and nitrogen levels on economics of sweet corn presented in table:1 the highest gross returns(126663₹/ha), higher net returns (101700₹/ha) and maximum B:Cratio(2:0) recorded spacing 45×20cm+120kgN/ha. From the study, it was inferred that combination of plant geometry and nitrogen levels gives higher yield as they play major role in assimilation rate and metabolic activites in plant. The maximum net returns were noticed with 120kgN/ha. The benefit cost ratio was also enhanced with higher nitrogen levels. Higher yield of green cobs and fodder directly contributed to the returns at higher nitrogen levels. Ashok (2009) [1], Bhatt (2012) [2] and singh *et al*., 2013 [1] observes similar results.

Table1: Effect of plant geometry and nitrogen levels on yield and economics of sweet corn.

Treatments	Green cob yield(t/ha)	Stover yield (t/ha)	Cost of cultivation (₹/ha)	Gross returns (₹/ha)	Net returns	B:C ratio
60× 15 cm+ 90 kgN/ha.	3.83	4.120417	41497.3	106602	65104.8	1.57
60× 15 cm+ 100 kgN/ha	3.96	4.196667	41638.6	112450	70811.4	1.70
60× 15 cm+ 120 kgN/ha	4.15	4.563333	41921.2	122550	80628.8	1.92
45× 20 cm+ 90 kgN/ha.	4.01	4.4225	41743.3	115619	73875.9	1.77
45× 20 cm+ 100 kgN/ha	4.15.	4.600417	41938.9	122122	80183.2	1.91
45× 20 cm+ 120 kgN/ha	4.24	4.788625	42221.2	126663	84441.9	2.00
30× 30cm+ 90 kgN/ha	4.00	4.352917	42097.3	114605	72507.3	1.72
30× 30cm+ 100 kgN/ha	3.89	4.2525	42238.9	112063	69823.6	1.65
30× 30cm+ 120 kgN/ha	3.82	4.263333	42521.2	108117	57721.1	1.15
S.Em (±)	0.04	0.09				
CD(P=0.05)	0.13	0.28				

Conclusion

It may be concluded that spacing 45× 20 cm+ 120 kgN/ha. Showed higher yield and economics. Therefore, it is recommended for farmers for receiving higher yield and economic benefits of sweet corn.

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