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EFFECT OF PLANT GEOMETRY AND NITROGEN LEVELS ON GROWTH AND YIELD OF SWE ET CORN (*Zea mays* Saccharata L.)

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***Key words**: Spacing, Nitrogen levels, Yield.*

Abstract–The field experiment was conducted during *kharif* season, 2020 at crop research farm Department of Agronomy, SHUATS, Praygraj (U.P). the experiment was laid out in randomized block design with nine treatments replicated thrice with the different spacing (60 × 15 cm, 45 × 20 cm and 30 × 30 cm)with different combination of treatments as follows 90 kg/ha, 100 kg/ha, 120kg/ha of nitrogen,application of levels with spacing significantly influenced the growth parameters, yield attributes and yield at 80 DAS Along with spacing 45×20 cm recorded highest plant height (152.5 cm), numbers of leaves (12.1), crop growth rate (61.8), and maximum dry weight (166.8g) whereas numbers of cobs per plant (1.7cm), length of cobs per plant (16.8 cm), girth of cob (15.68 cm), no.of grain row per cob (13.6), no of seeds per row (35.7), no. of grains per cob (511), green cob yield (4.42) and stover yield (4.78) was recorded significantly higher in treatment with 45×20cm +120kg N/ha.

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, occupied a place of "queen of cereals". It serve as a basic raw materials and ingredient to thousands of industrial products that include starch oil, protein, alcoholic beverages, food sweeteners, cosmetic film, textiles, gum, package, paper industries etc. maize is third most important cereals crop after rice and wheat, in human diet. In India it is grown on 8.71m.ha., area with 21 mt 0.85m ha area with about 1.51 mt of production and 1776 kg/ha productivity.

Sweet corn (*Zea mays* saccharata) grows successfully for vegetable purpose in different countries like USA, Canada, Thailand Sri Lanka etc. in India its cultivation is popular in Haryana, Maharashtra, Meghalaya, and Andhra Pradesh. The term "sweet corn" is commonly used by food industry. its contains carbohydrate 19 g sugar 3.2g, dietary fibre 2.7g, zeig the fat 1.2g, proteins 3.2g, 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). It is a species of maize however, it differs from all other species of corn because it contain 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).

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 to 45 days compared to normal grain maize. It has a great market potential and high market potential and high market value in india (Sahoo and Mahapatra, 2007). In central india people consume a sizeable quantity of green cob, which generates potential for sweet corn cultivation in the area. The plant growth involves various environment and agronomical factors such as water, temperature, light, nutrients. Liu *et al.* (2004; Yadav, 2008 and Yuan *et al*., 2003). The nitrogen is a vital nutrient for the activity of plant organs it is a fraction of many

components such as; amino acids, chlorophyll and etc. thus, plant growth can be affected by the amount of nitrogen, Najm, *et al.* (2012) and Taiz and Zeiger (2002).

Previous studies have shown that nitrogen fertilizer can increase the growth characteristics such as; plant height, shoot dry matter and leaf area index (LAI), Sincik *et al*. (2008). Maize crop differs in its ability to maintain LAI, CGR and above ground dry matter production at different levels of N application (Pandey *et al*., 2000). 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) requirement for maize crop has been worked out but the recommended plant spacing and nitrogen dose for hybrid and composites of normal maize may not be applicable for the sweet corn.

MATERIALS AND METHODS

The experiment was carried out during *kharif* season of 2020 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute SHUATS, Prayagraj (U.P), which is located at 25°57′N latitude, 87°50′E longitude and at an altitude of 98 meter above the mean sea level. The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH, 7.3), low in organic carbon (0.57%), medium in available N (230 kg/ha), high in available P(32.10 kg/ha). The seeds of sweet corn (*Zea mays*) variety "sugar 75" were sown on 1st August 2020, with seed rate 10-11 kg/ha and sown at 4-5 cm depth. Recommended doses 120:50:40 of N:P:K were applied.

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

RESULTS AND DISCUSSION

Effect of the plant geometry and nitrogen levels on growth parameters

Effect of plant geometry and nitrogen levels on growth parameters on kharif sweet corn are presented in Table 1.

GROWTH PARAMETERS

Plant Height

The results revealed that spacing of 45 cm × 20 cm+ 120 kg/ha. at 80 DAS recorded maximum plant height (152.60 cm). Higher N Applications increase the cell division, cell elongation, nucleus formation as well as green foliage. It also encourages the shoot growth. Therefore, higher dose of N increased the chlorophyll content which increased the rate of photosynthesis and extension of stem resulting increased plant height (Dawadi and Sha, 2012). The competition for space, light, nutrients and moisture within the intra row plants were maximum medium

Table 1. Effect of plant geometry and nitrogen levels on growth parameters of kharif sweet corn (80 days)

Treatments	Plant Height (cm)	No. of leaves/plant	Dry weight	Crop growth rate g/m/days
60 cm × 15 cm + 90 kg N/ha	135.8	11.4	157.9	60
60 cm × 15 cm + 100 kg N/ha	140.8	11	160.2	61.5
60 cm × 15 + 120 kg N/ha	138.4	10.5	163.6	61.8
45 cm × 20 cm + 90 kg N/ha	140.4	11.1	158.5	60
45 cm × 20 cm + 100 kg N/ha	148.2	10.7	164.1	61.3
45 cm × 20 cm + 120 kg N/ha	152.6	12.1	166.8	60.7
30 cm × 30 cm + 90 kg N/ha	138.9	11.1	161.4	60.1
30 cm × 30 cm + 100 kg N/ha	135.6	12.1	159.4	59.4
30 cm × 20cm + 120 kg N/ha	139.8	11.1	161.4	60.3
SEm (±)	3.34	0.21	1.41	-
CD (P=0.05)	9.94	0.63	4.20	-

row spacing may be resulted such reduction in thickness of stem girth. The significant reduction in plant growth with reduction in row spacing seems to be the resultant of natural shading due to over crowding of plants which might have reduced the availability of light within the crop canopy and inhibited elongation of lower internodes (Mathukia *et al.* 2014).

Number of Leaves Per Plant

At 80 DAS maximum numbers of leaves (12.1) was recorded with application of spacing 45 cm × 20 cm + 120 kg N/ha and minimum number of leaves (3.89) was recorded with application of 60 cm × 15cm + 90 kg N /ha. The higher of functional leaves under fertilizer level might be due to increase in cell division, assimilation rate and, metabolic activities in plant, Kunjir (2004).

Dry Weight

AT 80 DAS,significantly highest plant dry weight (166.80g) was observed with application of spacing 45cm × 20cm + 120 kg N/ha at 40 and 60 DAS which was superior over the treatments. Thakur *et al.* (2000) and Raja (2001) viz, plant height and dry matter percentage with increase in the level of nitrogen application due to nitrogen play active role in metabolic processes and the higher availability of source under spacing of n 45 cm× 20 cm recorded higher values of the sink in terms of length, girth and weight of cob and weight of grain per cob.

Crop Growth Rate

Crop growth rate at (20-40 DAS) no watering at initial stages of crop, crop weed crop competition of crop plants for nutrient uptake level even if excess plants are germinated and no thinning is done Further at 60-80 DAS observed that maximum crop growth rate was obtained with application of 60 cm × 15 cm + 120 kg/ha. Significantly superior over rest of the treatments

Effect of Plant Geometry and Nitrogen Levels on Yield Attributes and Yield

Effect of plant geometry and nitrogen levels on growth parameters on kharif sweet corn are presented in Table 2.

Yield attributes and yield

Yield attributes and yield of sweet corn. Number of cobs plant (1.7) were recorded to be high test at a recommended spacing and application of (30 cm × 30 cm + 100 kg N/ha), maximum length of cobs per plant (16.8), maximum birth of cobs per plant (15.68 cm) with a recommended spacing and application of (45cm × 20 cm + 120 kg N/ha), maximum number of grain row per cob (13.60) at a recommended spacing and application of (60 cm × 15 cm + 100kg N/ha), maximum numbers of seed per seeds per grain row (35.7), numbers of grain per cob (511), maximum green Cob yield (4.15 t/ha) and fodder yield (4.78 t/ha) with a recommended spacing and application of (45 cm × 20 cm + 120 kg N/ha) Shakarami (2009); Almaz *et al*. (2017) and Lone *et al.* (2013) reported that increased availability of nitrogen to crop at higher levels resulted in production of longer cobs accompanied by increased grain filling that gave more kernels per cob. Better corn and grain development due to increased availability of nitrogen and greater production of photosynthesis and their efficient translocation for development of reproductive parts.

Table 2. Effect of plant geometry and nitrogen levels on growth parameters of kharif sweet corn (80 days)

Treatments	No. of cobs/ plant	Length of cob (cm)	Girth of cob (cm)	No. of grain row/cob	No.of seeds/ grain row	No.of grains/ cob	Green cob yield t/ha	Stover yield t/ha
60 cm × 15 cm + 90 kg N/ha	1.5	16.6	14.6	12.1	29.5	442	3.83	4.120417
60 cm × 15 cm + 100 kg N/ha	1.2	15.9	14.6	13.6	28.6	466	3.96	4.196667
60 cm × 15 cm + 120 kg N/ha	1.4	16.7	15.56	12.7	34.1	494	4.15	4.563333
45 cm × 20 cm + 90 kg N/ha	1.6	15.8	14.7	12.5	29.6	459	4.01	4.4225
45 cm × 20 cm + 100 kg N/ha	1.3	15.8	14.9	12.8	34.4	493	4.15	4.600417
45 cm × 20 cm + 120 kg N/ha	1.5	16.8	15.68	13.1	35.7	511	4.24	4.788625
30 cm × 30 cm + 90 kg N/ha	1.4	15.8	14.7	12.8	29.6	474	4.00	4.35917
30 cm × 30 cm + 100 kg N/ha	1.7	16.6	14.7	13.3	31	475	3.89	4.2525
45 cm × 20 cm + 120 kg N/ha	1.2	16.6	14.8	12.9	28.7	467	3.82	4.263333
SEm (+)	0.09	0.25	0.26	0.47	0.67	7.43	0,04	0.09
CD (P=0.05)	0.29	0.76	0.78	-	1.93	22.10	0.13	0.28

CONCLUSION

In conclusion it is inferred the present investigation that spacing 45 cm × 20 cm along with nitrogen application 120 kg/ha at 80 DAS recommended for receiving higher yield of sweet corn.

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