EFFECT OF ORGANIC AND INORGANIC FERTILIZER ON GROWTH YIELD AND PHENOTYPECHARACTER OF BABY CORN

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SYNOPSIS

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INTRODUCTION:

Maize (Zea mays L.) is the third rank cereal crop after wheat and rice. In the world it accounts for 10% and 28 % of the area and production of cereals, respectively. It occupies an important position in the world economy and trade as a food, feed and industrial grain crop (Lal, 2001). In India, maize is grown in an area of 6.6 million ha, with a production of 13.3 million tonnes at average productivity of 2015 kg per ha (Anon., 2002). Maize is classified in to different groups or types based on the endosperm of kernels among which baby corn is grown for vegetable purpose. This venture proved enormously successful in countries like Thailand, Taiwan, Srilanka and Myanmar. The countries like Guatemala, Zambia, Zimbabwe and South Africa have also started cultivation. Now, Thailand and China are the world leaders in baby corn production. It is widely accepted and habituated as a cereal vegetable in USA, Europe and in some Asian countries. In India, cultivation of baby corn is of recent development. Its cultivation is increasing in Meghalaya, Western Uttar Pradesh, Haryana, Maharashtra, Karnataka and Andhra Pradesh (Ramachandrappa et al.2004).

Baby corn is a delicious and nutritive vegetable and it is consumed as a natural food. It is very tasty, sweet and easy to consume because of its tenderness and sweetness with nutritive value addition. It provides carbohydrates, protein, fat, sugar, minerals and vitamins in palatable, wholesome, hygienic and digestible form. It is rich in phosphorus content (86 mg/100 g edible portion in comparison to 21 to 57 mg phosphorus content in other commonly used vegetables). It is a low calorie vegetable having higher fiber content without cholesterol. Besides nutritive advantage, it is also free from residual effect of pesticides as it is harvested within a week of tassel emergence and the young cob is wrapped up tightly with husk and well protected from insects and pests (Pradeep Kumar et. al., 2004).

Breeding programmes are currently being taken up under All India Co–ordinated Research Project on maize improvement at Kullu valley in Himachal Pradesh and Karimnagar and Hyderabad in Andhra Pardesh to indentify and develop hybrids and high yielding varities of baby corn. It is believed that agronomy of baby corn is not much different from that of regular maize crop. However, the stages and purpose of harvest are different in baby corn. Hence it is necessary to develop specific cultivation practices for baby corn production. Depending on agro – climatic conditions, 3-4 crops of baby corn can be grown in a year realizing higher profit per hectare per season. It is a fact that the economic yield is the result of crop architecture, which is determined by the plant geometry. In order to realize maximum yield of good quality baby corn, it is important to maintain optimum plant population with suitable crop geometry.

Despite its great importance in Indian agriculture as well as export potentiality, a very little work has been done on baby corn in India (Verma et al., 1998 and Sukanya et al., 2000). In the past, the practice has been to use any genotype of maize for the cultivation of baby corn and detailed studies have not been conducted to identify and/or develop varieties suitable for baby corn. In India, only few single cross hybrids have been found to be preferred for baby corn cultivation (HM-4, HQPM-1, PEHM-2, Prakash etc.). All these hybrids were originally developed for grain purpose and they are considered for baby corn usage on account of some characteristic features. At present, exclusive and specific single cross baby corn hybrids are not available under public domain. Developing baby corn cultivars/hybrids specifically adaptable to Indian conditions might be one of the approaches, especially for fulfilling short and/or medium term goals. Here also emphasis needs to be given on early maturity, considering the fact that many crops can be taken under the Indian conditions due to reasonably favourable weather throughout the year in most of the states. Early maturity is also an important factor for determining comparative advantage especially in relation to other vegetables in specific season.

Baby corn production being a very recent development, cultivation practices need to be standardized before it finds a prominent place in most of the intensive cropping systems due to its short duration nature. Inadequate spacing leads to low productivity along with poor quality. Though spacing requirement of gain maize has been standardized, the information on influence of spacing on yield and quality of baby corn hybrids and composites is lacking. Corn being an exhaustive crop, its requirement for fertilizers especially for nitrogen is prominent. Nitrogen is essential constituent of chlorophyll, protoplasm and enzymes. Further, it governs utilization of phosphorus and potassium. It is an important factor for better vegetative growth and boosting up the yield of cereals (Shrivastava and Sinha, 1992). The review indicates that baby corn yield increased with increasing levels of nitrogen application.

The highest baby corn yield (21.9 q ha-1) was obtained with 120 kg N ha-1 which was significantly superior over 60 and 90 kg N ha-1 (Pandey et al., 2000). Also Sahoo and Panda (1999) reported that application of 160 kg N ha-1 significantly increased green cobs, fodder yield and total dry matter yield.

OBJECTIVES:

1. To study the effect of organic and inorganic fertilizer on growth of plant

2. To find out the best combination of organic manure and inorganic fertilizers.

3. To study about the phenotype character of plant

4. To study the effect of different doses of fertilizer on baby corn

Review of literature:

In this chapter an effort has been made to compile and present all the available literature on the growth, yield and quality of sweet corn in relation to different fertilizer levels and plant densities. The relevant literature in respect of the fertilizer levels and spacings in sweet corn is meager. Therefore, the available literature and relevant reviews on its analogue, dentcorn and baby corn are also reviewed in this chapter. The literatures collected on these aspects have been presented under the following broad heads.

1.1 Effect of spacings on growth and development

At Dapoli (Maharashtra), Dalvi (1984) conducted a field experiment during *rabi* season and reported that number of functional leaves and dry matter accumulation were significantly higher at 60 cm x 30 cm spacings during all the growth stages as compared to 30 cm x 30 cm and 45 cm x 30 cm spacing. The effect of spacing on growth, development and yield of baby corn varieties at Bangalore during summer season under irrigated condition was studied. It was found that the spacings of 45 cm x 15 cm recorded the maximum plant height of 181.8 cm, which was significantly superior to wider row spacings of 60 cm x 15 cm. Further, it was observed that the spacings of 45 x 30 cm recorded the maximum leaf area of 4826.42 cm2 palnt-1 which was significantly superior over 60 cm x 15 cm and 45 cm x 15 cm spacing. Similarly, the 45 cm x 30 cm spacings produced significantly higher dry matter of 223.25 g plant-1 over other spacing. The lowest drymatter of 166.47 g palnt-1 was recorded in 60 cm x 15 cm spacings (Sukanya *et al*. 2000). A field trial was conducted by Thakur *et al.* (2000) to study effect of planting geometry on baby corn during 1995-1996 at Bajaura. They reported maximum plant height with wider spacings (60 cm x 30 cm) than closer spacing (40 cm x 40 cm, 50 cm x 30 cm, 40 cm x 35 cm, 50 cm x 25 cm).

1.2 Effect of spacings on yield attributing characters

Thakur *et al.* (1995) evaluated the performance of maize cultivar early composite for baby corn production under different spacing regimes *viz.*, 40 cm and 60 cm of inter-row spacing and 10 cm and 20 cm of intra-row spacing. They found 40 cm x 20 cm and 40 cm x 10 cm spacings as optimum for baby corn and baby corn + green fodder productions, respectively. While in another study, Kotch *et al.* (1995) showed 10 cm intra plant spacings as the best for baby corn production. The cultivar 'Sweet Boy' sown in rows of 75 cm apart with 12.5 cm, 16.7 cm or 25 cm between plants showed that plant density had no significant effect on yield per unit area, plant height, cob length or weight but increasing density significantly reduced cob size and yield per plant (Faiguebaum and Olivares, 1995). A field experiment was conducted on baby corn at Bajaura (Himachal Pradesh) indicated that the wider spacings of 60 cm x 20 cm increased significantly all the yield attributing character viz. cob per plant, cob weight with and without husk of baby corn as compared to other spacing of 40 cm x 20 cm, 60 cm x 10 cm and 40 cm x 10 cm (Thakur *et al.*, 1997).

1.3 Effect of spacings on yield

Singh *et al.* (1982) in a field experiment at Dholi (Bihar) observed that 80 thousand plant population per ha gave significantly higher yield of pop corn (32.9 qha-1) as compared to lower levels of population. The difference between 60 and 70 thousand plant population (26.9 q ha-1 and 27.9 q ha-1) was not significant. A field experiment at Bajaura recorded significantly higher yield of baby corn (1737 kg ha-1) by planting the crop at 40 x 20 cm spacings than the other spacing of 60 x10 cm (1561 kg ha-1), 40 x10 cm (1588 kgha-1) and 60 x 20 cm (1555 kg ha-1) Thakur *et al*. (1995).

Kar *et al*. (2006) conducted a field experiment at Bhubaneshwar and found that the spacings of 60 x 20 cm significantly increased the green cob yield, highest net return and benefit : cost ratio over the rest of the treatments *viz*. 45 x 30, 45 x 20 and 60 x 30 cm respectively. In Dapoli, Zarapkar (2006) conducted field experiment and concluded that baby corn yield was significantly higher under the closer spacings of 45 cm x 20 cm than remaining spacing viz. 30 cm x 20 cm and 60 cm x 20 cm. However, green fodder yield and total biomass yield per hectare were significantly higher under spacings of 30 cm x 20 cm than other spacing. A field experiment showed that the close spacings of 45 cm x 20 cm reported significantly higher cob yield (114.99 q per ha), stover yield (73.79 q ha-1) and total biomass yield(188.78 q ha-1) than the remaining broader spacing (60 x 20 cm and 75 x 20 cm) (Kunjir, 2007).

1.4 Effect of spacings on quality characters

Sukanya *et al.* (1999) conducted a field experiment at Bangalore and reported that the wider spacings of 45 cm x 30 cm recorded significantly higher protein, reducing sugars and ascorbic acid content than other spacing (45 cm x 15 cm and 60 cm x 15 cm). A field experiment at Dapoli (Ratnagiri) showed that the wider spacings of 75 cm x 20 cm recorded significantly higher uptake of nitrogen, phosphorus, potassium protein and sugar than the closer spacings of 60 cm x 20 cm and 40 cm x 20 cm (Kunjir 2007).

2. Effect of genotypes on growth attributes, yield attributes,yield and quality parameters of baby corn

In varietal trials conducted by Trongpanich (1992) and Fanngfupong *et al*. (1994), 'Thai super sweet composite 1 DMR' was found to be the best producing higher baby corn yield along with higher preference scores for texture, odour, colour and taste as well as the best percentage decreases in total soluble solids during canning. They also recommended five other cultivars for baby corn as alternative to farmer's ruling cultivar super sweet.

Yu *et al*. (1993) developed a hybrid by crossing two inbred lines *viz*., 'Duo-7' and 'Wu Dai Bai', which has good adaptability and recorded maximum height of 220 cm producing fine ears suitable for processing as baby corn. This hybrid matured in about 60 days during summer and 68 days in spring. They also recommended elite maize cultivar 'Lusan 1/U -1' for baby corn cultivation. In another trial, Kotch *et al.* (1995) evaluated eleven maize cultivars for baby corn production in USA. They found that 'Robust 41-10' gave markedly higher cob yield with good organoleptic qualities such as colour, taste and appearance. While in another study, Thakur *et al*. (1995) found that maize cultivar 'early composite' as the best variety for baby corn production. It recorded higher yield of 2032 kg/ha. Spaner *et al.* (1996) studied the performance of three local cultivars *viz*., an improved land race 'ICTA farm corn', 'an open pollinated cross 7728' and the 'hybrid pioneer 3098' for baby corn production. The 'hybrid pioneer 3098' and 'ICTA farm corn' cultivars gave significantly higher number of marketable yield/ha and found to be superior to 'cross 7728'. However, sensory evaluations revealed that the three cultivars did not differ in overall quality with respect to ear appearance and kernel colour and even when boiled with creole seasoning.

3. Effect of fertilizer levels on growth attributes, yield attributes,yield and quality parameters of baby corn

Thakur *et al.* (1997) reported that application of 150 - 200 kg N/ha had significant favorable effect on plant height, functional leaves per plant, stem diameter, dry matter per plant, green fodder yield, baby corn yield and net returns/ ha compared to the lower N levels. The increased N doses favorably affected the yield attributes, yield and monetary returns. Application of 120 kg N/ha gave significantly higher yield and more net returns compared with 60 and 90 kg/ha (Pandey *et al.* 2000). Dev and Saxena (2002) reported that the application of 60 kg P2O5/ha recorded significantly higher LAI of baby corn over 20, 40, 80 kg P2O5/ha and control (no P application). Grazia *et al.* (2003) observed that application of 200 kg N/ha recorded significantly higher leaf area, plant height, ear diameter and biomass production of baby corn than control.

The increased plant height with increased levels of N fertilization of baby corn and influenced dry matter production by influencing leaf area development, leaf area maintenance and photosynthetic efficiency (Muthukrushnan and Subramanian, 1984) reported. Singh and Singh (1984) observed more number of cobs in nitrogen fertilized N plots of baby corn mainly due to reduction in per cent of barrenness' rather than prolificity. Prasad *et al*. (1985) found that plant height and leaf area index in baby corn increased with increasing nitrogen application from no nitrogen to 150 kg per ha. An increase in grain yield was observed with increase in phosphorous application rate from 40 kg to 160 kg per ha. The maximum yield was obtained at 120 kg P2O5 per ha which was found on par with 160 kg P2O5 per ha but significantly higher over 40 and 80 kg P2O5 per ha (Hera *et al.*, 1986).

4. Effect of spacings, genotypes and fertility levels on economics of baby corn

Thakur *et al.* (1998) reported maximum net return of Rs. 50,843 per ha and net return per rupee invested (Rs. 3.00) when crop spaced at 40 cm x 40 cm. The net profit and the benefit: cost ratios were highest at a spacings of 40 cm x 20 cm than other spacing of 40 cm x 20 cm and 40 cm x 15 cm (Sahoo and Panda, 1999).

Pandey *et al.* (2002) from field study concluded that the plant densities 1,33,000 and 1,66,000 plants ha-1 recorded significantly more net returns and benefit : cost ratio than 1,11,000 plants per ha. Kunjir (2004) conducted a field experiment at Dapoli (Ratnagiri) and found that the highest gross return (Rs. 81,750.86 per ha), net profit (Rs. 22,097.65 per ha) and benefit : cost ratio (1.37) were obtained at spacings of 45 cm x 20 cm than other plant spacing (60 cm x 20 cm and 75 cm x 20 cm).

Material and Methods:

Location

The experiment is conducting at the main Experiment Station, Department of Agriculture, Lovely Professional University, Phagwara, Punjab, located at latitude of 31.2498190 and longitude of 75.7084550 as map coordinates along with altitude of 232 m above sea level.

Climate

• Punjab generally receives rains from both southwest and northwest monsoons.The rainfall is mostly confined to the monsoon period from June to end of September with highest rainfall during July**.**

Soil

• The soil status of experimental site is sandy loam soil, well fertile and free from weeds and well tilth soil .Has good drainage and rich in nutrients. The soil experimental field was sandy loam in texture, acidic in reaction with low level of organic carbon, available nitrogen and available P_2O_5 but a medium level of available K_2O.

Experimental details:

1. Year of experimentation	:	2018
2. Recommended dose of fertilizer	:	As per the treatments
3. No of treatment	:	10
4. No of replication	:	03
5. Total no. of plots	:	10X3=30
6. Plot size	:	5m x 5m
7. Date of sowing	:	______________
8. Experimental design	:	RBD
9. Crop	:	Baby corn
10. Spacing	:	(45cm X 10cm)
11. Estimated area needed	:	850m^2
12. Seed rate	:	8-10kg/acre

Collection of samples

1. Available N, P_2O_5, K_2O
2. Soil pH
3. Organic Carbon
4. Electrical Conductivity (EC)

Treatment details :

T_0. Control

T_1. RDF

T_2. 75% RDF + 25% Vermi-compost

T_3. 50% RDF + 50% Vermi-compost

T_4. 50% RDF + 25% FYM + 25% Vermi-compost

T_5. 25% RDF + 50% FYM + 25% Vermi-compost

T_6. 25% RDF + 25% FYM + 50% Vermi-compost

T_7. 50% RDF + 50% FYM

T_8. 75% RDF + 25% FYM

T_9. 50% Vermi-compost + 50% FYM

Layout :

R_1	R_2	R_3
T_0	T_9	T_1
T_1	T_8	T_0
T_2	T_7	T_9
T_3	T_6	T_8
T_4	T_5	T_7
T_8	T_4	T_6
T_9	T_3	T_5
T_7	T_2	T_4
T_5	T_1	T_3
T_6	T_0	T_2

Observations

1. Plant height

2. Stem girth

3. Number of leaves

4. Leaf area

5. Baby corn weight with husk

6. Baby corn yield per plant

7. Length of Cob

8. Green fodder yield

9. Dry matter production

10. Economics

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