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Influence of Spacing and Varieties on Growth and Yield of Baby Corn (*Zea mays* L.)

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted during *kharif*, 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U. P). The soil of given experimental plot was sandy loam in texture, neutral in soil reaction (pH 7.1), low in organic carbon (0.36 %), available N (171.48 kg/ha), available P (15.2 kg/ha) and available K (232.5 kg/ha).The experiment was laid in Randomized Block Design with Ten treatments and three replications. The treatments are as follows, T_1: G-5414 + 40 cm x 15 cm, T_2: G-5414 + 50 cm x 15 cm, T_3: G-5414 + 60 cm x 15 cm, T_4: G-5417 + 40 cm x 15 cm, T_5: G-5417 + 50 cm x 15 cm, T_6: G-5417 + 60 cm x 15 cm, T_7: Shine-60 + 40 cm x 15 cm, T_8: Shine-60 + 50 cm x 15 cm, T_9: Shine-60 + 60 cm x 15 cm are used. The results showed that application of treatment Shine-60 + 60 x 15 cm was recorded highest plant height (172.38 cm), No. of leaves/Plant (12.75), Plant dry weight (90.00 g/plant) whereas, Crop Growth Rate (39.77 g/m^2/day) and Relative Growth Rate (0.036 g/g/day) was recorded significantly highest in treatment G-5414 + 40 cm x 15 cm. However, No. of Cobs/Plant (2.82), length of the Cob/Plant (17.55 cm), Cob weight with husk (44.18 g), Cob weight without husk (17.94 g), Cob yield with husk (28.78 t/ha) and Cob yield without husk (6.87 t/ha) was obtained in the treatment of Shine-60 + 60 cm x 15 cm as compared to the other treatments.

Keywords: G-5414; G-5417; shine-60; spacing, yield.

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1. INTRODUCTION

After wheat and rice, maize (*Zea mays* L.) is the world's third most significant cereal crop [1]. With the advancement of science and technology, there has been a shift in the traditional use of maize as food, with an increase in the consumption of green ears, particularly in cities and towns. As a result, "baby corn" is a profitable crop that allows for diversification of production, value aggregation, and increased income [2]. The immature ear of properly grown maize taken within 2-3 days after silking is known as baby corn. Indian agriculture, baby corn assumes special significance on account of its utilisation as food, feed and fodder besides several industrial uses.

The ear of maize is called baby corn (*Zea mays* L.). It's not a distinctive kind of corn as sweet corn or corn. It's a dehusked maize ear that's been harvested early, especially when the silk hasn't emerged yet or has just appeared and there hasn't been any fertilization, or when the shank with unpollinated silk is baby corn. In the market, baby corn ears with a light-yellow color and uniform row arrangement, 10-12 cm long and a diameter of 1.0-1.5 cm are chosen [3]. The economic product is harvested just after silk emergence (1-2 cm long). In India, maize *(Zea mays* L) is produced on 9.5 million hectares, with production and productivity of 25.12 mt and 2585.00 kg ha-1, respectively (Agriculture statistics at a glance, 2015). Globally maize is cultivated over an area of 179.09 million tonnes ha^{-1} and productivity is 5.4 tonnes/ha (Anonymous, 2018). Maize assumes a special significance in Indian agriculture on account of its utilization as food, feed, fodder, silage and specially corn besides several industrial uses. Baby corn is one of the most important dual-purpose crops grown round the year in India [4]. Currently, Thailand and China are the world leaders in baby corn production. (Reena Rani et al., 2017).

Crop geometry is considered as one of the most important factors which has to be maintained optimum crop level to harvest maximum solar radiations and utilizes the soil resources effectively and in turn better photosynthetic formation. Though the spacing requirement has been standardized for grain and fodder maize, the information on the influence of spacing on yield of baby corn composite is still obscure [5]. The form and size of each plant's leaf area is determined by its spatial layout, which determines effective radiant energy absorption, as well as the proliferation and growth of shoots and their activity (Ayman et al. 2019). Only when the population of plants permits each plant to reach its full natural potential can maximum production be predicted [3]. As a result, I'll have to figure out the best plant spacing based on other agronomic criteria.

Varieties play an important role in gaining better and highest yield. Depending upon the variety., we can obtain disease-free, pest-free, hybrid etc. varieties are one of the very important parameters in crop production. Most of the agronomic requirements of baby corn are similar to grain maize; however, for successful production of baby corn, selection of suitable varieties needs to be studied under local agro-climatic conditions. Varieties also play a significant role in obtaining plant dry weight, crop growth rate, days to tasseling, days to silking number of cobs/plants, weight of cob with husk, weight of cob without husk, corn yield, and fodder yield, among other factors (Sharma et al*.,* 2014).

2. MATERIALS AND METHODS

The experiment was carried out during *Kharif,* 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh, which is located at 25.28^{o} N latitude, 81.54^{o} E longitude and 98 m altitude above mean sea level. The experiment laid out in Randomized Block Design which constitute of nine treatments with T_1: G-5414 + 40 cm x 15 cm, T_2: G-5414 + 50 cm x 15 cm, T_3: G-5414 + 60 cm x 15 cm, T_4: G-5417 + 40 cm x 15 cm, T_5: G-5417 + 50 cm x 15 cm, T_6: G-5417 + 60 cm x 15 cm, T_7: Shine-60 + 40 cm x 15 cm, T_8- Shine-60 + 50 cm x15 cm, T_9- Shine-60 + 60 cm x 15 cm in three replications. The three varieties were sown in respective plots and spacing was maintained as per the treatment details. Several plant growth data were recorded at numerous intervals from germination to harvest, as well as several yield parameters after harvest. These parameters are growth factors such as plant height (cm), Number of Leaves/Plant and Plant dry weight (g) were recorded. The yield parameters like Number of Cobs/Plant, Length of the Cob/Plant, Cob weight with husk, Cob weight without husk, Cob yield with husk, Cob yield without husk were recorded and statistically analyzed using Analysis of Variance (ANOVA) as applicable to Randomized

Block Design (Gomez K.A and Gomez A.A. 1984).

3. RESULTS AND DISCUSSION

3.1 Growth Attributes

3.1.1 Plant Height (cm)

Data in Table 1 shows that significantly highest plant height (172.38 cm) was observed in the treatment with Shine-60 + 60 cm x 15 cm, all over the treatments. However, the treatments with application of G-5417 + 60 cm x 15 cm (171.32 cm) and Shine-60 + 50 cm x 15 cm (171.97 cm) which were found to be statistically at par with treatment Shine-60 + 60 cm x 15 cm. the probable reason for the influence in plant height might be due to Shine-60 variety proved superior over other varieties. These findings are in line with the earlier findings by Enujeke [6] and spacing practices had significant effects on plant height (cm) of maize. This may be due to the competition between the inter and intra plants for sun light, water, nutrients and space at closer spacing, whereas optimum spacing helped in significantly highest plant height. Significant results were obtained due to the optimum spacing of 60 cm x 15 cm [1].

3.2 Number of leaves/Plants

Treatment with Shine-60 + 60 cm x 15 cm were recorded with significantly maximum Number of leaves/plant (12.75) over all the treatments. However, the treatments with G-5417 + 60 cm x 15 cm (12.53) and Shine-60 + 50 cm x 15 cm (12.68) which were found to be statistically at par with Shine-60 + 60 cm x 15 cm. The variety Shine-60 recorded higher number of leaves compared to G-5417 and G-5414 variety. The probable reason might be due to the genetical potential of the variety that has helped in producing higher number of leaves. The optimum spacing resulted in increase in stem elongation and root growth which resulted in higher number of leaves and also the receiving adequate amount of sunlight, water and nutrients also resulted in higher leaves production. The results were in accordance with Scaria et al., [7] and Neelum and Dutta [1].

3.3 Plant Dry Weight (g/plant)

Treatment with Shine-60 + 60 cm x 15 cm was recorded with significantly maximum dry weight (90.00 g/plant) over all the treatments. However, the treatments with G-5417 + 60 cm x 15 cm (89.10 g/plant) and Shine-60 + 50 cm x 15 cm (89.34 g/plant) which were found to be statistically at par with Shine-60 + 60 cm x 15 cm. shine-60 variety showed highest dry weight due to higher growth and biomass accumulation when compared to other varieties. Similar trends were observed by Alom et al., [8]. Higher dry matter production is seen at 60 cm x 15 cm spacing due to enhanced photosynthetic activity due to increased light exposure and increased nutrient availability of plants, resulting in higher dry weight, the treatment showed the increasing trend in dry weight up to harvest stage, Sarker et al., [8] also reported similar results.

Table1. Effect of Spacing and different Varieties of Baby corn on Growth attributes

S No.	Treatments	Plant height (cm)	Number of leaves/plant	Dry weight
1	G-5414 + 40cm x15cm	163.14	11.35	85.23
2	G-5414 + 50cmx15cm	164.18	11.47	85.83
3	G-5414 + 60cmx15cm	170.20	12.31	88.10
4	G-5417 + 40cmx15cm	165.58	11.62	86.21
5	G-5417 + 50cmx15cm	168.87	12.17	87.42
6	G-5417 + 60cmx15cm	171.32	12.53	89.10
7	Shine-60+40cmx15cm	167.28	11.84	86.36
8	Shine-60+50cmx15cm	171.97	12.68	89.34
9	Shine-60+60cmx15cm	172.38	12.75	90.00
	F test	S	S	S
	S.EM(±)	0.45	0.08	0.30
	CD (P=0.05)	1.35	0.23	0.91

Table 2. Effect of Spacing and different Varieties of Baby corn on Yield and Yield attributes

S No.	Treatments	No.of cobs/plant	Length of cobs/plant	Cob weight (g)		Cob yield		Straw yield
				With husk	Without husk	With husk	Without husk	
1	G-5414 + 40cm x15cm	2.25	13.24	40.44	14.26	24.41	5.96	29.67
2	G-5414 + 50cmx15cm	2.37	14.12	4.96	14.74	24.72	6.07	26.27
3	G-5414 + 60cmx15cm	2.63	16.28	42.94	16.81	26.88	6.47	25.80
4	G-5417 + 40cmx15cm	2.41	14.95	41.47	15.18	26.13	6.19	27.53
5	G-5417 + 50cmx15cm	2.58	15.85	42.39	16.32	27.53	6.54	30.93
6	G-5417 + 60cmx15cm	2.70	16.95	43.47	17.24	28.17	6.74	33.79
7	Shine-60+40cmx15cm	2.50	15.53	41.81	15.86	26.28	6.52	28.63
8	Shine-60+50cmx15cm	2.76	17.18	43.72	17.53	27.90	6.66	32.20
9	Shine-60+60cmx15cm	2.82	17.55	44.18	13.94	28.78	6.87	34.63
	F test	S	S	S	S	S	S	S
	S.EM(+)	0.04	0.021	0.31	0.24	0.41	0.09	0.48
	CD (P=0.05)	0.13	0.64	0.92	0.73	1.22	0.27	1.44

4. YIELD AND YIELD ATTTRIBUTES

Significantly maximum Number of Cobs/Plant (2.82) was recorded with the application of treatment Shine-60 + 60 cm x 15 cm all over the treatments. However, the treatments G-5417 + 60 cm x 15 cm (2.70) and Shine-60 + 50 cm x 15 cm (2.76) which were found to be statistically at par with shine-60 +60 x 15 cm. Higher number of cobs/plant might have been possible due to more vigour and strength attained by the plants as a result of better photosynthetic activities with sufficient availability of light, and supply of nutrients in balanced quantity of the plants at growing stages. Sarker et al., [9] who conducted a field experiment to investigate the effect of planting spacing and nitrogen levels on yield and quality of baby corn and green fodder, observed the highest number of cobs/plant (2.17) in the treatment combination including spacing of 45 cm x 20 cm + Nitrogen 200 kg /ha similarly. Significantly maximum length of cobs per plant (17.55cm) was recorded with a application of treatment Shine-60 + 50 cm x 15 cm (17.18 cm) which were found to statistically at par with Shine-60 + 60 cm x 15 cm.

Significantly highest Cob weight (44.18 g) with husk and highest cob weight (17.94 g) without husk was recorded with the application of treatment Shine-60 + 60 cm x 15 cm over all the treatments. The performance of Shine-60 variety with regards to cob length was found to be superior. The probable reason for this may be the genetic makeup of the variety that has helped in improving photosynthetic activity due to increased source of capacity and efficient translocation of photosynthesis to the sink. The results were in accordance to Kabir et al., [10]. Increased nutrient absorption and a shorter period to fulfil the needed heat units for normal plant growth and development, as well as enhanced yield quality, were the results of improved moisture availability and soil temperature management. The results were recorded similar with Harigilas [11].

Significantly highest Cob yield (28.78 t/ha) with husk, highest Cob yield (6.87 t/ha) without husk and highest straw yield (34.63 t/ha) with husk was recorded with the treatment application of Shine-60 + 60 cm x 15 cm over all the treatments. The seed yield performance of maize varieties was highly encouraging, and it followed a similar pattern to the yield features. Shine-60 exhibited better seed and straw yields than other maize varieties, which might be attributable to increased production efficiency, as seen by improvements in many yield attributing features. Similar findings have been reported by Asis et

al., [12] and Medhi et al. [13]. The optimum spacing 60 cm x 15 cm helped plant to receive sufficient amount of heat, water and nutrients from soil which increased number of cobs/plants, productivity, profitability, and nutrient use efficiency in baby corn. The results were similar to kumar et al. [4].

5. SUMMARY

Highest plant height (172.38 cm), Number of Leaves/Plant (12.75), Plant dry weight (90.00 g/plant), maximum number of cobs/pant (17.55 cm), cob weight with husk (44.18 g), cob weight without husk (17.94 g), cob yield with husk (28.78 t/ha), cob yield without husk (6.87 t/ha) and straw yield (34.63 t/ha) were recorded with the treat Shine-60 + 60 cm x 15 cm.

At the same time Higher Gross Returns (Rs.96180/ha, net return (Rs.59294.3/ha) and Benefit Cost Ratio (1.60) was obtained in the treatment Shine-60 + 60 cm x 15 cm.

6. CONCLUSION

In the conclusion, the study revealed that baby corn sown in kharif season and applied with fertilizers (150:60:40 N: P_2O_5: K_2O), Shine-60 with the spacing 60 cm x 15 cm has performed well in obtaining maximum cob yield and other yield contributing characters and found to be more productive and economically viable. It is therefore advisable to be adopted by farmers producing baby corn [14]. Hence, variety Shine-60 with the spacing 60 cm x 15 cm is beneficial under eastern Uttar Pradesh conditions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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