Effect of crop geometry and nitrogen levels on growth, productivity of baby corn (Zea mays L.)

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Abstract
This paper documents the effects of crop geometry and nitrogen levels on baby corn maize crop. In this view, a field experiment was carried out during winter (rabi) season of 2019 at Instructional cum Research Farm, IGKV, Raipur, in split plot design with three replications. It was conducted to study the effect of crop geometry and nitrogen levels on growth, yield attributes of baby corn G5414. The treatments involve four crop geometries and three nitrogen levels. Crop geometries are 30 x 20 cm, 40 x 20 cm, 50 x 20 cm, 60 x 20 cm and nitrogen levels are 75,100,125 kg N ha⁻¹. Result illustrated that number of young cobs plant⁻¹, length of cob with and without husk, diameter of cob with and without husk N content in cob and fodder was found significantly higher in planting geometry of 60 x 20 cm and all these characters were also found superior under treatments receiving 125 kg N ha⁻¹. Cob yield and harvest index was observed maximum in planting geometry of 50 x 20 cm and at the application of 125 kg N ha⁻¹. Planting geometry of 50 x 20 cm (1,00,000 plants ha⁻¹) with 125 kg N ha⁻¹ gives highest gross returns (Rs. 198576 ha⁻¹), net returns (Rs. 154337 ha⁻¹) and B:C ratio(2.5). Further, the spacing of 50 x 20 cm application of nitrogen i.e. 125 N kg ha⁻¹ was found to be economical as it gave highest monetary benefits and B:C ratio.

Keywords: Baby corn, crop geometry, nitrogen levels and cob yield

Introduction
Maize (Zea mays L.) is popularly known as Makka or Makai in hindi, is one of the most important cereal crops in the world's agricultural economy, both as man-made food and as animal feed. This crop is miracle crop because of high productivity, there is no cereal on earth that has such immense potential, and that's why it's called "Cereals Queen." Maize is grown in almost all the states of India. It is grown in 9380 thousand hectare area and its production is 28753 thousand tonne with a productivity of 3065 kg per hectare in India (Anonymous 2018). It is cultivated in 133.41 thousand hectare area and production is 317.52 thousand tonne with an average productivity of 2380 kg per hectare (Anonymous 2018). Baby corn is not a specific type of corn like sweet corn or pop corn, it can be any type of corn which is used after harvesting when the silk get emerged or just going to be emerged and fertilization has not taken place, we can also say baby corn is un-pollinated silk. A baby corn might be compared with an “egg” in terms of minerals. It is best for fodder crop because of high succulent, digestibility and palatability. It contains protein (15-18%), sugar (0.016-0.020%), phosphorus (0.6-0.9%), potassium (2-3%), fibre (3-5%), calcium (0.3-0.5%), ascorbic acid (75-80 mg/100 g). The baby corn is extremely nutritious and has a comparable nutritional value with other high-priced vegetables such as cauliflower, cabbage, French beans, spinach, lady finger, tomato, radish etc. Whole miniature cob of baby corn is consumed. Baby corn plant can be used as feed for animals as it is very nutritious.

Optimum crop geometry is one of the main factors for higher productivity, whereby underground resources are used efficiently and maximum solar radiation is collected which in effect contributes to better photosynthesis (Monneveux et al., 2005). Yield increases with N levels up to a certain point but the optimum economic N dose is independent of the plant density.
Geographically, Raipur is the central part of Chhattisgarh and lies at 21°15' N latitude and 81°37'E longitude at an altitude of 296 meters above mean sea level (MSL) and located in the Chhattisgarh plain zone of Chhattisgarh. It was conducted during rabi season (2019-20). Soil having pH (7.5), EC (0.21 dm⁻¹) and OC (0.58%), available N, P, K were 120, 16.34 and 272.02 kg ha⁻¹, respectively. Sowing date was 27 November, 2019 and harvested on 13 March, 2020. Experiment was laid out in split plot designs with three replications.

**Result and Discussion**

**Observations**

**Number of young cobs plant⁻¹**

Highest number of young cobs plant⁻¹ was found in planting geometry of 60 x 20 cm (S4) and maximum number of cobs plant⁻¹ was found in plot receiving 125kg N ha⁻¹ (N3).

**Length of cob**

Highest length of young cob with husk was found in planting geometry of 60 x 20 cm (S4) and maximum length was found in plot receiving 125kg N ha⁻¹ (N3). Maximum young cob length without husk was found in planting geometry of 60 x 20 cm (S4) and maximum length with out husk was found in the plot receiving 125 kg N ha⁻¹ (N3).

**Diameter of cob**

Young cob diameter (with husk) obtained maximum value in planting geometry of 60 x 20 cm(S4) and in nitrogen level of 125 kg N ha⁻¹ (N3). Planting geometry and nitrogen levels showed significant effect on young cob diameter (with out husk). Maximum diameter was obtained under 60 x 20 cm (S4).

Amongst varying nitrogen levels, maximum diameter was recorded under the treatments where high nitrogen rate of 125 kg N ha⁻¹ (N3) were used.

**N content in cob and fodder**

Data illustrate that nitrogen content in cob and fodder was found maximum in planting geometry of 60 x 20 cm (S4) and nitrogen level of 125 kg N ha⁻¹ as compared to other treatments.

**Cob yield**

Planting geometry of 50 x 20 cm(1,00,000 plants ha⁻¹) along with the application of 125 kg N ha⁻¹, produce maximum cob yield with out husk of (31.93 q ha⁻¹) and with husk(159.9 q ha⁻¹) as compared to other treatments. Thavaprakash and Velayudham (2007) reported the geometry of the crops. Green cob yield and nutrient uptake of infant corn significantly influenced. It was also found that plant spacing of 45 x 25 cm had the highest green cob yield and biological equivalent yield of 60 x 19 cm while nutrient uptake was the highest in 60 x 19 cm compared to 45 x 25 cm.

**Economics**

Planting geometry of 50 x 20 cm (1,00,000 plants ha⁻¹) with 125 kg N ha⁻¹ gives highest gross returns (Rs. 198576 ha⁻¹), net returns (Rs. 154337 ha⁻¹) and B:C ratio(2.5). Further, the spacing of 50 x 20 cm application of nitrogen i.e 125 N kg ha⁻¹ was found to be economical as it gave highest monetary benefits and B:C ratio.

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### Table 1: Post harvest observations of baby corn maize as influenced due to crop geometry and nitrogen levels

| Treatments Main plot: Crop geometry (cm) | No. of young cobs plant⁻¹ | Young cob length(cm) With husk | Without husk | Young cob diameter(cm) With husk | Without husk | Nitrogen content (%) Cob | Fodder | Young cob yield (q ha⁻¹) without husk | Harvest index (HI) |
|-----------------------------------------|---------------------------|-------------------------------|--------------|----------------------------------|--------------|-------------------------|---------|--------------------------------------|-----------------|
| S₁ : 30 x 20                           | 1.37                      | 22.8                          | 9.0          | 3.5                              | 1.6          | 1.55                    | 1.32    | 21.23                                | 22.4            |
| S₂ : 40 x 20                           | 1.74                      | 23.7                          | 9.6          | 3.9                              | 1.8          | 1.59                    | 1.38    | 22.28                                | 26.3            |
| S₃ : 50 x 20                           | 2.19                      | 23.8                          | 10.1         | 4.3                              | 2.0          | 1.60                    | 1.42    | 27.04                                | 33.1            |
| S₄ : 60 x 20                           | 2.89                      | 25.7                          | 10.5         | 4.4                              | 2.2          | 1.60                    | 1.48    | 25.86                                | 32.8            |
| S.E(m) ±                                | 0.06                      | 0.54                          | 0.19         | 0.08                             | 0.06         | 0.04                    | 0.03    | 0.33                                 | 0.31            |
| CD (0.05%)                             | 0.20                      | 1.87                          | 0.65         | 0.28                             | 0.20         | NS                      | NS      | 1.14                                 | 1.09            |

**Sub plot: Nitrogen levels (kg ha⁻¹)**

| N₁ : 75                                | 1.88                      | 23.3                          | 9.1          | 3.8                              | 1.7          | 1.53                    | 1.36    | 20.98                                | 27.2            |
| N₂ : 100                               | 1.97                      | 24.0                          | 9.9          | 3.9                              | 1.9          | 1.58                    | 1.40    | 23.51                                | 28.0            |
| N₃ : 125                               | 2.28                      | 24.8                          | 10.4         | 4.4                              | 2.1          | 1.64                    | 1.43    | 27.81                                | 30.8            |
| S.E(m) ±                                | 0.03                      | 0.31                          | 0.14         | 0.05                             | 0.02         | 0.02                    | 0.04    | 0.25                                 | 0.29            |
| CD (0.05%)                             | 0.10                      | 0.93                          | 0.41         | 0.15                             | 0.07         | 0.07                    | NS      | 0.76                                 | 0.88            |
| Interaction (SxN)                       | S                        | NS                            | NS          | S                                | S            | NS                      | S       | NS                                   | S               |

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### Table 2: Economics of baby corn maize as influenced due to crop geometry and nitrogen levels

| Treatment | Cost of cultivation (Rs ha⁻¹) | Gross Monitory Return (Rs ha⁻¹) | Net Monitory Return (Rs ha⁻¹) | B:C Net |
|-----------|-------------------------------|--------------------------------|-------------------------------|---------|
| Main plot: Crop geometry (cm) |                               |                                |                               |         |
| S₁ : 30 x 20 | 69403                          | 154491                         | 103149                        | 2.2     |
| S₂ : 40 x 20 | 63763                          | 154570                         | 108215                        | 2.4     |
| S₃ : 50 x 20 | 62203                          | 173166                         | 129811                        | 2.8     |
| S₄ : 60 x 20 | 60403                          | 165437                         | 124689                        | 2.7     |
| S.E(m) ±     | --                             | 2046                           | 12046                         | 0.03    |
| CD (0.05 %) | --                             | 7081                           | 7081                          | 0.11    |

**Sub plot: Nitrogen levels (kg ha⁻¹)**

| N₁ : 75 | 63616                          | 143418                         | 98290                         | 2.3     |
| N₂ : 100| 63945                          | 159627                         | 114170                        | 2.5     |
| N₃ : 125| 64267                          | 182718                         | 136139                        | 2.9     |
| S.E(m) ± | --                             | 1347                           | 1347                          | 0.02    |
| CD (0.05 %) | --                             | 4037                           | 4037                          | 0.06    |
| Interaction (SxN) | NS                             | S                             | S                             |         |
Fig 1: Economics of baby corn as influenced by planting geometry and nitrogen levels

Conclusion
Planting geometry of 50 x 20 cm (1,00,000 plants ha\(^{-1}\)) along with the application of 125 kg N ha\(^{-1}\), produce maximum cob yield with out husk of (31.93 q ha\(^{-1}\)) and with husk (159.9 q ha\(^{-1}\)) as compared to other treatments.

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References
1. Kashinath BC. Performance of fodder maize under varied crop geometry and nitrogen levels. M.Sc. (Ag.) Agronomy ANGRAU Rajendranagar Hyderabad, 2014, 500030.
2. Patel SB, Patel AG, Chavda JD, Patel MA. Effect of time of sowing and nitrogen levels on yield attributes, yield and quality parameters of rabi forage maize (Zea mays L.). Int. J Che. Studies. 2017; 5(5):868-871.
3. Ramachandrappa BK, Nanjappa HV, Thimmegowda MN, Soumya TM. Production management of profitable babycorn cultivation. Indian Farming. 2004; 39:1-2.
4. Rathika S, Velayudham K, Muthukrishnan P, Thavapraakaah N. Effect of crop geometry and topping practices on the productivity of baby corn (Zea mays L.) based intercropping systems. Madras Agricultural Journal. 2008; 95(7-12):380-385.
5. Chandramohan M, Reddy GH, Reddy MH. Effect of different levels of N, P and K on maize. Indian Journal of Agronomy. 1982; 22:235-300.
6. Channakeshava Sharma KN. Studies on response of popcorn varieties to sowing dates, row spacing and plant population under dry land conditions. M.Sc. (Agri.) Thesis Submitted to UAS, Bangalore, 1990.
7. Channakeshava BC, Rama Prasanna KP, Ramachandra BK. Influence of spacings and fertilizer levels on seed yield and yield components in African tall fodder maize. Karnataka. J Agric. Sci. 2000; 13(2):343-348.
8. Eltelib AH, Hamad AM, Ali EE. Effect of nitrogen and phosphorus fertilization on growth, yield and quality of fodder maize. Journal of Agronomy. 2006; 5(3):515-518.
9. Genter CF, Camper HM. Component plant part development in maize as affected by hybrids and population density. Agron. J. 1973; 65:669-671.
10. Girija LD. Effect of various levels of nitrogen and phosphorus on growth and yield of forage maize (Zea mays L.). Forage Research. 2002; 27(4):263-266.
11. Gollar RG, Patil VC. Effect of plant density on growth and yield of maize. Karnataka Journal of Agricultural Sciences. 2000; 13(1):1-6.
12. Gomez KA, Gomez AA. Statistical procedures for agricultural research (2 ed). John wiley and sons, New York, 1984, 680.
13. Hay RKM, Walker AJ. Introduction to the physiology of crop yield. Longman Scientific & Technical, Harlow, England, 1989.
14. Iqbal A, Ayub M, Zaman H, Ahmad R. Impact of nutrient management and legumes association on agro qualitative traits of maize forage. Pakistan. J Bot. 2006; 38:1079-1084.
15. Sepat Seema, Kumar A. Nitrogen management in maize (Zea mays) under life Saving and assured irrigations. Indian J Agril. Sci. 2007; 77(7):451-454.
16. Sharma NN, Paul, SR, Sarma D. Response of maize (Zea mays) to nitrogen and phosphorus under rainfed conditions of the hills zone of Assam. Indian J Argon. 2000; 45:128-131.
17. Spandana P Bhatt. Response of sweet corn hybrid to varying plant densities and Nitrogen levels. African Journal of Agricultural Research. 2012; 7(46): 6158-6166.