Maize Journal (April 2024) 13(1): 52-56

RESEARCH PAPER

Performance of baby corn in variable planting densities and nutrient levels under rainfed condition of North east India

Sanjenbam Dayananda Singh · Ankita Kumari Bhagat

Abstract Under the hill rainfed ecosystem of north eastern India, maize is the second important staple crop after rice. Due to high adaptability under variable climatic conditions, shorter duration and dual purpose of baby corn is gaining momentum and can be a potential crop in this region. A field experiment was conducted during the *kharif* season of 2020-21 to identify the most suitable baby corn variety under different planting densities and nutrient levels. Four varieties of baby corn were tested in two different planting densities (100000 and 125000 plants/ha with 50 cm × 20 cm and 40 cm × 20 cm plant spacing, respectively) and two nutrient levels (RDF *i.e.* 120:60:60 and 150% RDF *i.e.* 180:90:90 N:P:K kg/ha) in split-split plot design replicated thrice. The variety CMVL BC2 recorded the maximum plant height (209.5 cm), highest plant population (101100 plants/ha), shortest duration to first picking (51.3 days) and maximum number of pickings (6.08) than the other varieties. There was no variation in planting densities and nutrient levels on the yield and economic return of the baby corn. However, CMVL BC2 outperformed the baby corn yield with husk (12487 kg/ha) under RDF application and green fodder yield (33681 kg/ha) under higher planting density. Higher planting population and application of RDF in CMVL BC2 recorded the highest net return (275035 Rs./ha) and B:C (4.69). Thus, it can be concluded that the variety CMVL BC2, with a high planting density of 125,000 plants/ha and a nutrient level of 120:60:60 NPK kg/ha, is suitable for attaining higher yield and economic benefits under rainfed conditions of north east India.

Keywords: Baby corn · Planting densities · Nutrient levels · Growth · Yield

Introduction

The North-east region of India is characterized by diverse agro climatic conditions, where maize (*Zea mays* L.) is the second staple crop, next to rice (Singh *et al*., 2022). The importance of maize in the region lies in the fact that it is not only used for human consumption but at the same time it is also widely used for animal feed and corn starch industry, baby corns etc. (Layek *et al.,* 2016). The region's favourable climate and soil conditions make it suitable for baby corn cultivation as it can be grown on the wide range of elevations from foothills to higher elevation of North eastern Himalayas. Baby corn, being a dual purpose and short duration crop has gained immense popularity these days (Hargilas, 2015). Currently, the demand and production of baby corn is gaining momentum in India (Rathika, 2014). Therefore, baby corn offers promising chances for the crop diversification and income generation because of its adaptability to the diverse atmospheric conditions of North-east India (Bindhani *et al*., 2007).

Baby corn is an unfertilized dehusked cob which is harvested just after the emergence of the cob (Bairagi *et al*., 2015). The cob is light yellow in colour with a regular arrangement of kernels in rows and the ideal size of the cob of baby corn is 10-12 cm long and 1-1.5 cm diameter (Muthukumar *et al*., 2005). Being a newly introduced crop in north eastern India, production

✉ Sanjenbam Dayananda Singh: daysanj@gmail.com

Department of Agronomy, College of Agriculture, Central Agricultural University, Imphal-795001, Manipur, India

Received: 04 January 2024/ Accepted: 05 February 2024

technology needs to be developed. There are many agronomic practices but planting density, nutrient management and varieties of the crop play a crucial role in determining the crop's yield. As baby corn is a non-tillering crop, plant density directly affects the yield and yield attributes of the crop (Dar *et al.,* 2017). Optimum planting density is also affected by nutrient management and varietal options as well (Sahoo *et al*., 2020). The identification of ideal planting densities and nutrient requirements will help in promoting the sustainable farming practices. Moreover, the response of different varieties to this region is also crucial for selecting the appropriate varieties for cultivation. In addition to its economic significance, increased productivity of baby corn, a nutritious crop, contributes to food security and improved nutrition in the region. Considering all these points of view, the present experiment was conducted to evaluate the response of baby corn varieties to planting densities and nutrient levels under acid soil of North East India.

Materials and methods

A field experiment was conducted during *kharif* season, 2018 at Andro Research Farm, Central Agricultural University, Imphal, Manipur to study the performance of baby corn in variable planting population and nutrient levels under acid soil on growth, yield and economics of varieties. The soil at the site is sandy clay loam soil with 5.8 pH, 1.74% organic carbon, 206.5 kg/ha available nitrogen, 20.85 kg/ha available phosphorus and 196 kg/ha exchangeable potassium. During the entire crop growth period, total rainfall received is 562 mm with average maximum and minimum temperature 34^{o}C and 19^{o}C respectively. The experiment was laid out in split-split plot design, with main plot consisting of two treatment combinations, i.e., two plant densities (Normal-100000 plants/ha, High-125000 plants/ha), sub plot consisting of two nutrient levels [120:60:60 (RDF), 180:90:90 kg (150% RDF) NPK/ha] and sub-sub plot comprising of four varieties (CMVL BC2, AH7043, AH5021, HM 4) with three replications. The crop was sown on 12th July 2020. As per the treatments N, P and K were applied to the crops in the form of urea, single super phosphate and muriate of potash, respectively. Out of these, half of the nitrogen and full phosphorus and potassium was applied as basal dose and rest half of the nitrogen is applied at knee high and tasselling stage. The observations on plant height at harvest (in cm), plant population, days to first picking and number of pickings were recorded. Also, the economics of crop is calculated as per the market price of baby corn. Statistical analysis of the recorded data was done using the standard procedure as suggested by Gomez and Gomez (2010).

Results and discussion

Growth and yield attributes

The growth and yield attributes, *viz*. plant height (cm), plant population, days to first picking and number of pickings were recorded at the time of harvesting. The results from Table 1 showed that plant population is significantly higher in high density planting (125000 plants/ha) and rest of the attributes are not affected by the plant density. Also, nutrient levels did not affect any of the growth and yield attributes. Moreover, the varieties are significantly affecting growth and yield attributes. Among the varieties, CMVL BC2 gave the significantly higher plant height (209.5 cm) followed by HM 4 and CMVL BC2 also gave significantly highest results for plant population (101100 plants/ha), number of pickings (6.08) and minimum days to first picking (51.3 days) and followed by HM 4. Similarly, Archana and Lalitha Bai (2016) recorded 25 per cent increase in tallness of plants with high plant density as compared to less plant density because of competition to receive more solar radiation. There were no interaction effects between the planting densities, nutrient levels and varieties at the growth parameters of baby corn.

Cob yield and fodder yield

Planting density and nutrient levels has shown no noticeable effect on the baby corn yield and economic return but there were significant variations between the varieties (Table 2). Among the varieties, the highest baby corn yield, net return and B:C was observed under the variety CMVL BC2 followed by AH7043, AH5021 and HM4, respectively. On interaction, CMVL BC2 gave the highest cob yield with husk (12487 kg/ha) when 100% RDF is applied (Table. 3). Similarly, cob yield without husk was not affected by the planting density and nutrient levels but there is significant three-way interaction between the factors including planting

Table 1. Influence of planting densities and nutrient levels on growth and yield attributes of baby corn varieties

Treatments	Plant height (cm)	Plant Population (000' plant)	Days to first picking	Number of pickings
Density (plant ha^{-1})				
Normal (100000)	191.9	89.4	53.4	5.33
High (125000)	196.2	102.7	53.5	5.21
SE(m)±	2.6	0.3	0.2	0.10
CD at 5%	NS	2.0	NS	NS
Nutrient Levels (kg/ha)				
RDF (120:60:60)	188.2	95.4	53.8	5.21
150% RDF (180:90:90)	199.9	96.7	53.1	5.33
SE(m)±	3.9	0.6	0.3	0.07
CD at 5%	NS	NS	NS	NS
Varieties				
CMVL BC2	209.5	101.1	51.3	6.08
AH7043	183.2	94.3	54.2	5.17
AH5021	184.5	89.9	56.3	4.42
HM 4	198.9	98.9	52.1	5.42
SE(m)±	5.7	0.5	0.4	0.14
CD at 5%	16.6	1.5	1.1	0.4

Table 2. Influence of planting densities and nutrient levels on growth and yield attributes of baby corn varieties

Treatments	Babycorn yield with husk (kg/ha)	Babycorn yield without husk (kg/ha)	Green fodder yield (kg/ha)	Net returns (Rs. /ha)	B:C
Density (plant ha^{-1})					
Normal (100000)	8176	2539	24447	155426	3.16
High (125000)	8507	2849	27013	177755	3.31
SE(m)±	179	81	283	6670	0.09
CD at 5%	NS	NS	1722	NS	NS
Nutrient Levels (kg/ha)					
RDF (120:60:60)	8304	2730	26159	172528	3.39
150% RDF (180:90:90)	8378	2658	25301	160652	3.08
SE(m)±	205	101	182	8242	0.11
CD at 5%	NS	NS	715	NS	NS
Varieties					
CMVL BC2	11744	3460	32782	234895	4.15
AH7043	6128	2488	21968	146368	2.96
AH5021	5802	1794	20286	89167	2.19
HM 4	9691	3034	27884	195931	3.63
SE(m)±	275	120	434	9845	0.13
CD at 5%	802	350	1268	28736	0.40

density, nutrient levels and varieties (Table 4). On the interaction of all these factors, significantly higher cob yield without husk was recorded by the variety CMVL BC2 (3936 kg/ha) under higher planting density with 100% RDF and at par with the same variety under normal planting density with 150% RDF.

Higher planting density (125000 plants/ha) and nutrient level with recommended dose of 120:60:60 (Table 2)

Table 3. Interaction of different nutrient levels and varieties on baby corn yield with husk (kg/ha)

	CMVL BC2	AH7043	AH5021	HM 4
RDF	12487	5898	5523	9309
150% RDF	11001	6357	6082	10073
SE(m)±	389			
CD (P=0.05)	1135			

Table 4. Interaction of different planting density, nutrient levels and varieties on baby corn yield without husk (kg/ha)

	Normal density		High density	
	RDF	150% RDF	RDF	150% RDF
CMVL BC2	3108	3652	3936	3143
AH7043	2556	2192	2321	2883
AH5021	1588	1488	2060	2041
HM 4	3003	2725	3267	3140
SE(m)±	240			
CD (P=0.05)	701			

Table 5. Interaction of different planting densities and varieties on green fodder yield (kg/ha)

	CMVL BC2	AH7043	AH5021	HM 4
Normal density	31883	21110	19478	25319
High density	33681	22825	21095	30448
SE(m)±	614			
CD (P=0.05)	1793			

recorded maximum green fodder yield (27013 kg/ha and 26159 kg/ha respectively). Similarly, Sukanya *et al.* (1998) observed significant rise in green fodder yield with increase in plant population. Green fodder yield of baby corn is influenced by the interaction of factors *viz.,* planting density × variety and nutrient level × variety. The interaction between planting density and varieties revealed that the variety CMVL BC 2 (31883 kg/ha) gave significantly highest yield under high planting density followed by the same variety under normal planting density (Table 5). The interaction effect of nutrient levels affects the green fodder yield depending upon the varieties planted where in CMVL BC 2 yielded significantly higher at 100% RDF and at par with the same variety at 150% RDF (Table 6) The increase in plant density leads to increase in fodder yield (Sahoo *et al*., 2020) due to better interception of light, solar radiation and nutrient use efficiency (Dawadi and Sah, 2012). Among the varieties, CMVL BC2 was found significantly superior over other varieties with maximum cob yield with husk (11744 kg/ha), cob yield without husk (3460 kg/ha) and green fodder yield (32782 kg/ha) followed by HM 4 (Table 2). The genetic potential of the variety CMVL BC2 might be better than the rest of the varieties and has shown good performance.

Net return and B:C ratio

The assessment of economics of baby corn showed that net returns and B:C ratio are not significantly affected by the planting density and nutrient levels (Table 2). But the varieties have shown marked influence on the economics of the crop. Among the varieties, CMVL BC2 has recorded highest net returns (Rs. 234895) and B:C ratio (4.15). The combined effect of planting densities and nutrient levels has shown significant effect on the net returns and

Table 6. Interaction of different nutrient levels and varieties on green fodder yield (kg/ha)

	CMVL BC2	AH7043	AH5021	HM 4
RDF	33561	21284	20787	29003
150% RDF	32003	22652	19786	26764
SE(m)±	614			
CD (P=0.05)	1793			

Table 7. Interaction of different planting density, nutrient levels and varieties on net return of baby corn (Rs./ha)

	Normal density		High density	
	RDF	150% RDF	RDF	150% RDF
CMVL BC2	211546	248689	275035	204312
AH7043	155114	122723	133580	174057
AH5021	77331	63428	112021	103887
HM 4	196909	167666	218690	200458
SE(m)±	19690			
CD (P=0.05)	57487			

Table 8. Interaction of different planting density, nutrient levels and varieties on B:C of baby corn

	Normal density		High density	
	RDF	150% RDF	RDF	150% RDF
CMVL BC2	4.04	4.33	4.69	3.56
AH7043	3.23	2.64	2.79	3.18
AH5021	2.11	1.85	2.50	2.30
HM 4	3.83	3.24	3.94	3.51
SE(m)±	0.26			
CD (P=0.05)	0.76			

B:C ratio with the different varieties planted. The three-way effect on the net returns has a significant influence as shown in the Table 7 where the variety CMVL BC 2 gave significantly higher net returns when planted in higher density and 100% RDF (Rs. /ha 275035) and at par with variety CMVL BC 2 with normal planting density and 150% RDF (Rs. /ha 248689), HM 4 with high panting density and 100% RDF (Rs. /ha 218690) and CMVL 2 with normal planting density at 100% RDF (Rs. /ha 211546). The results from Table 8 have shown the same significant interaction effect between all the factors on the B:C ratio as well. The reason for this could be that variety producing taller plants gave higher fodder yield resulting in high returns (Hargilas, 2015). Also, variety with higher cob yield and green fodder yield results in higher returns when compared to rest of the varieties.

Conclusion

Based on the experimental findings, it can be concluded that the variety CMVL BC2, with a high planting density of 125,000 plants/ha and a nutrient level of 120:60:60 NPK kg/ha, is recommended for attaining higher yields and economic benefits under rainfed conditions of north east India during the *kharif* season.

Acknowledgement

The authors are thankful to ICAR-Indian Institute of Maize Research, Ludhiana for providing financial and technical help under the All India Coordinated Research Project on Maize.

References

Archana, C. R. & Lalitha Bai, E. K. (2016). Influence of varieties and spacing on yield of dual purpose baby corn (*Zea mays* L.) in summer rice fallows of Kerala. *Journal of Tropical Agriculture*, **54**(2): 190-193.

Bairagi, S., Pandit, M. K., Sidhya, P., Adhikary, S. & Koundinya, A. V. V. (2015). Impacts of date of planting and crop geometry on growth and yield of baby corn (*Zea mays* var. rugosa). *Journal Crop and Weed*, **11**(2): 127-131.

Bindhani, A., Barik, K. C., Garnayak, L. M. & Mahapatra, P. K. (2017). Nitrogen management in baby corn (*Zea mays* L.). *Indian Journal of Agronomy*, **52**(2): 135-138.

Dar, E. A., Yousuf, A., Bhat, M. A. & Poonia, T. (2017). Growth, yield and quality of baby corn (*Zea mays* L.) and its fodder as influenced by crop geometry and nitrogen application-a review. *The Bioscan*, **12**(1): 463-469.

Dawadi, D. R. & Sah, S. K. (2012). Growth and yield of hybrid maize (*Zea mays* L.) in relation to planting density and nitrogen levels during winter season in Nepal. *Tropical Agricultural Research,* **23**(3): 218- 227.

Gomez, K. A. & Gomez, A. A. (2010). Statistical procedures for agriculture research. A Wiley Indian Pvt. Ltd., New Delhi, India.

Hargilas (2015). Evaluation of Baby Corn Hybrids Productivity and Profitability under Different Fertilizer Doses and Spacings. *International Journal of Bio-Resource and Stress Management*, ***6***(4): 503-508.

Layek, J., Ramkrushna, G. I., Suting, D., Ngangom, B., Krishnappa, R., Utpal, De & Das, A. (2016). Evaluation of Maize Cultivars for their Suitability under Organic Production System in North Eastern Hill Region of India. *Indian Journal of Hill Farming,* **29**(2): 19-24.

Muthukumar, V. B., Velayudham, K. & Thavaprakaash, N. (2015). Growth and yield of baby corn (*Zea mays* L.) as influenced by plant growth regulators and different time of nitrogen application. *Research Journal of Agriculture and Biological Sciences*, **1**(4): 303-307.

Rathika, S. (2014). Influence of crop geometry, intercropping and topping practices on green cob yield and fodder quality of baby corn (*Zea mays* L.). *International Journal of Agricultural Sciences*, **10**(1): 182-185.

Sahoo, S. C., Barik, K. C. & Patro, H. K. (2020). Effect of plant population on baby corn yield: A review. *International Journal of Chemical Studies*, ***8***(4): 2002-2005.

Singh, S. D., Konsam, J., Nongmeithem, N., Sanjem, P. & Samurailatpam, D. (2022). Influence of planting densities and nutrient levels on sweet corn varieties in North eastern Himalayan region of India. *Journal of Soils and Crops*, ***32***(1): 102-105.

Sukanya, T. S., Nanjappa, H. V. & Ramachandrappa, B. K. (1998). Growth parameters and yield of baby corn as influenced by varieties and spacing. *Mysore Journal of Agricultural Sciences*, **32**: 264-268.