Original Research Article

Agronomic Evaluation of Nitrogen and Boron on Growth and Yield of Baby Corn (*Zea mays* L.)

Notes: The words with red color words are meaning the words after correction.

ABSTRACT

The experiment was conducted in CRF, Department of Agronomy (SHUATS, Prayagraj) during *Rabi* 2022 season on babycorn. The treatments consisting of 3 levels of Nitrogen (40,50,60 kg/ha) and 3 levels of Boron (5,6,7 kg/ha) and A control. The experiment laid out in randomized block design with 10 treatments and replicated thrice. The result concluded that the significantlyhigher plant height (125.32 cm), dry matter (85.96 g/plant), cob length (20.19 cm), girth of cob 10.36 cm), number of cob (2.17), cob yield without husk (1498.59 kg/ha) and cob yield with husk (3110.46 kg/ha) is observed with application of Nitrogen 60 kg/ha + Boron 7 kg/ha (125.32 cm).

Key words:*Baby corn, Nitrogen, Boron, corn yield, economics.*

Introduction

Corn is one of the important cereal crops of India and used as food for human beings and feed for animals. Maize (*Zea mays* L.) ranks 3rd as a food-grain crop after wheat and rice and it is not only as a cereal but also as vegetable and fodder crop. Globally, as an immature vegetable, baby corn has attracted an increasing number of people's preference due to the enhancement of living standards and shift in dietary habit from non-vegetarian to vegetarian. However, production areas are still confined to a few countries including Thailand, Indonesia, India, and Brazil.

Maize is an annual shortday crosspollinated crop belongs to the family *Poaceae* (Gramineae) and the tribe Maydeae. Maize is generally grown in *kharif,* however, as a photo insensitive crop, it is grown during both *rabi* and summer as well. It has been credited as "Queen of the Cereals" because of its inherently higher yielding potential.

The quality of grain crops and crop yield is strongly dependent on the N fertilizer. Numerous researchers reported that N fertilizers application generally has positive and significant impacts on the crop growth and yield (Gasim 2001; Amanullah *et al.,* 2016). The maize plant characteristic such as leaf number per plant is increased by the application of N which improved

plant height (Akintoye 1996) by increasing the distance among the internodes and length of the internodes.

Boron (B) is an essential micronutrient needed for normal plant growth and development. It is involved in many plant processes such as sugar transport, cell wall synthesis, lignification, meristematic tissue cell division, petal and leaf bud formation, cell wall structure integrity, sugar and hydrocarbon metabolism and their transport, ribose nucleic acid (RNA) metabolism, respiration, indole acetic acid (IAA) metabolism, cytokinin production and transfer, phenol metabolism, nitrogen fixation, pollen germination, pollen tube formation and seed formation.

Boron, a micronutrient, is essential for pollen viability and seed production of crops as well as flowering and fruiting. It also plays vital role in nitrogen metabolism, hormonal action and cell division (BARI, 2006).

B deficiency affects photosynthesis indirectly by weakening vascular tissues responsible for ion transport (Wang *et al.,* 2015).B deficiency activates enzymatic and non-enzymatic oxidation by using phenol as substrate, resulting in elevated polyphenol oxidase and quinine concentrations, which are hazardous for plant growth and development (Hajiboland *et al.,* 2013).

Materials and Methods

Prayagraj belongs to sub-tropical and semi-arid climatic conditions, with both extremes of temperature, *i.e.,*winter and summer. It receives southwest monsoon rains which commence in the month of July and withdraws by the end of September. The meteorological data recorded during the growing period of experiment including the weekly average of maximum and minimum temperature, relative humidity and rainfall recorded at the agro-meteorological observatory unit, School of Forestry and Environment Sciences, Sam Higginbottom University of Agriculture Technology & Sciences, Prayagraj during the cropping period.

The experiment was carried out during *rabi* season of 2022at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (Allahabad) which is located at 25^{o} 24 “42” N latitude, 81^{o} 50 “56” E longitude and 98 m altitude above the mean sea level. This area is situated on the right side of the river Yamuna by the side of Allahabad Rewa Road about 5 km away from Prayagraj (Allahabad) city.

The experiment was laid out in randomized block design with 10 treatments and replicated thrice. The treatments consisting of 3 levels of Nitrogen (40,50,60 kg/ha) and 3 levels of Boron (5,6,7 kg/ha) and A control.

Results and Discussion

1. Plant height (cm)

60 DAS significantlyhigher plant height is observed with application of Nitrogen 60 kg/ha + Boron 7 kg/ha (125.32 cm), which is statistically at par with application of Nitrogen 60 kg/ha + Boron 5 kg/ha (124.67 cm).

Plant height was increased in Nitrogen 80 kg/ha + 1.00 ppm Boron foliar spray. Application of Nitrogen, with observed tallest plant height,nitrogen promoted the vegetative growth, probably influenced root growth in a positive manner which could have helped better absorption and transformation of nutrients from source to sink capacity of plants(Bhushan and Khare, 2018).Significant increase in plant height was observed due to soil and foliar application of boron and iron, due to increase in cell, cell enlargement, intermodal elongation and plant metabolism there by promoting vegetative growth which is positively correlated to the productive potentiality of plant and corroborates with the results of (Rakeshkumar and Bohra, 2014).

2. Plant dry weight (g)

Highest dry matter (85.96 g/plant) was observed (60 DAS) in Nitrogen 60 kg/ha + Boron 7 kg/ha, which was significantly superior over rest of the treatment. However,Nitrogen 60 kg/ha + Boron 5 kg/ha (84.94 g/plant) treatments stood statistically at par with Nitrogen 60 kg/ha + Boron 7 kg/ha.

Recorded highest dry weight in Nitrogen + Boron application of organic manure (Nitrogen,) along with fertilizer's helped to increase vegetative growth of baby corn – cabbage cropping sequence (Mullaimaran *et al.,* 2019).The increase in LAI might be due to significantincrease in leaf expansion, higher rate of cell division and cell enlargement and there by improved quality of vegetative growth due to boron fertilization. Comparable results were also reported by (Mahdi *et al.*,2012) and Kumar and Bohra (2014).

3. Number of cobs

The Highest number of cobs (2.17) were recorded significantly superior in Nitrogen 60 kg/ha + Boron 7 kg/ha. However, Nitrogen 60 kg/ha + Boron 5 kg/ha(2.13) treatments recorded statistically at par with Nitrogen 60 kg/ha + Boron 7 kg/ha treatment.

4. Length of cob

Length of cob (20.19 cm) recorded significantly superior over the treatment in Nitrogen 60 kg/ha + Boron 7 kg/ha. However, Nitrogen 60 kg/ha + Boron 5 kg/ha(20.08) treatments recorded statistically at par with Nitrogen 60 kg/ha + Boron 7 kg/ha treatment.

5. Girth of cob (cm)

The high girth of cobs (10.36 cm) were recorded in Nitrogen 60 kg/ha + Boron 7 kg/ha. and lowest recorded in Control (100:60:40 NPK kg/ha) (10.29).

6. Cob yield without husk (kg/ha)

The significantly higher cob yield without husk was observed (1498.59 kg/ha) in Nitrogen 60 kg/ha + Boron 7 kg/ha. However,Nitrogen 60 kg/ha + Boron 5 kg/ha (1491.61 t/ha) treatment stood statistically at par with Nitrogen 60 kg/ha + Boron 7 kg/ha.

7. Cob yield with husk (kg/ha)

The significantly higher cob yield with husk was observed (3110.46 kg/ha) in Nitrogen 60 kg/ha + Boron 7 kg/ha, rest of two treatments stood statistically at par with Nitrogen 60 kg/ha + Boron 5 kg/ha (3097.89 kg/ha).

Yield is an ultimate end product of many yield contributing components, physiological and morphologicalprocesses taking place in plants during growth and development. Boron fertilization has beneficial effect on physiological process, plant metabolism and plant growth, which leads to higher yield. Increase in cob and corn yield with application of boron was also reported by Kumar and Bohra (2014). Foliar spray and integrated use of fertilizer did bringabout significant improvement in overall growth of the cropby providing needed nutrients from initial stage and increasein supply of N, P and K in more synchronize way at thetreatment receiving integrated supply of nutrient from organicmanure along with inorganic fertilizer and which expressedin terms of plant height, cobs per plant, cob girth, cob length,cob weight with and

without husk by virtue of increasedphotosynthetic efficiency. Thus, greater availability ofphotosynthetic, metabolites and nutrients to developreproductive structures seems to have resulted in increasedproductive plants, cob girth, cob length and cob weight withthese nutrient management treatments. Similar results reported by Rani *et al.* (2011) and Roopashree*et al.* (2019).

CONCLUSION

From the experimental findings, it can be concluded thatthe application of (1498.59 kg/ha) in Nitrogen 60 kg/ha + Boron 7 kg/ha. However,Nitrogen 60 kg/ha + Boron 5 kg/ha (1491.61 t/ha) treatment stood statistically at par with Nitrogen 60 kg/ha + Boron 7 kg/ha.

REFERENCES

Bhushan, A. and Khare, N. 2018. Comparative analysis of three different organic manures on production potential of baby corn under poplar-based agroforestry system *International Journal of Farm Sciences* **8**(2): 85-88.

Kumar, P.G.K., Lalitha, B.S., Begum, S.S. and Somashekar, K.S. 2018. Effect of Foliar Nutrition on Nutritional Quality of Baby Corn (*Zea mays* L.) and Dehydrated Babycorn Enriched Products. *International Journal of Pure Applied Biosciences***6**(2): 107-113.

Kumar, V.M., Velayutham, A., Kumar, S.A., Vasanthi, D. 2018. Influence of Different Organic Manures on the Growth and Yield of Baby Corn. International *Journal of Advances in Agricultural Science and Technology***5**(7): 167-174.

Kumar, R. and Bohra, J.S. 2014. Effect of NPKS and Zn application on growth, yield, economics and quality of baby corn. *Archives of Agronomy and Soil Science***60**(9):1193-1206.

Mahdi, S.S., Hasan, B, Singh, L. 2012. Influence of Seed rate, nitrogen and boron on fodder maize (*Zea Mays* L.) in temperate conditions of western Himalayas. *Indian Journal of Agronomy*.**57**:85-88.

Mullaimaran, S., Haripriya. K. and Jaiganesh. V. 2019. Influence of organic amendments on yield, quality parameters and economic benefits of Baby corn (Zea mays L.) cultivation. *Journal of Applied Science and Computations* **6**(4):3701-3708.

Prasad, B.K., Singh, D.N. and Singh, S.N. 2003. Effect of Long Term Use of Fertilizer, Lime and Manures on Growth and Yield of Sweet Corn. *Journal of Indian Society of Soil Science***34**: 271-274.

Rajaee, S., Alikhani, H.A. andRaiesi, F. 2007. Effect of Plant Growth Promoting Potentials of *Azotobacterchroococcum*Native Strains on Growth, Yield and Uptake of Nutrients in Wheat. *Agris records***11**(41):285–297.

Rakeshkumar. and Bohra, J.S. 2014. Effect of NPKS and Zn application on growth, yield, economics and quality of baby corn. *Archives of Agronomy and Soil Science***60**(9):1193-1206.

Rani, P. L., Rao, A.R., Balaswamy, K. and Ahmed, S.R. 2011. Effect of Organic and Inorganic Sources of Nitrogen of on Growth, Yield and Economics of Baby Corn (*Zea mays* L.). *Plant Resources Management***2**(2): 218-223.

Roopashree, Nagaraju, D.H., Ramesha, Y.M., Bhagyalakshmi, T. and Raghavendra, S. 2019. Effect of Integrated Nutrient Management on Growth and Yield of Baby Corn (*Zea mays* L.). *International Journal of Current Microbiology Applied Sciences***8**(6): 766-772.

Rout, G.R. and Sahoo, S. 2015. Role of Iron in plant growth and metabolism. *Reviews in Agricultural Science***3**:1-24.

Table 1. Effect of nitrogen and boron on yield attributes of babycorn

	Treatment combinations	Plant height(cm)	Plant Dry weight (g)	Number of cobs/plants	Length of cob (cm)	Girth of cob (cm)
1	Nitrogen 40 kg/ha + Boron 3 kg/ha	122.51	82.06	1.90	18.17	10.31
2	Nitrogen 40 kg/ha + Boron 5 kg/ha	122.53	82.13	2.00	18.38	10.38
3	Nitrogen 40 kg/ha + Boron 7 kg/ha	124.32	84.41	2.01	19.36	10.28
4	Nitrogen 50 kg/ha + Boron 3 kg/ha	122.14	82.67	1.83	18.57	10.38
5	Nitrogen 50 kg/ha + Boron 5 kg/ha	122.18	83.43	1.87	18.53	10.34
6	Nitrogen 50 kg/ha + Boron 7 kg/ha	122.24	83.70	1.83	18.51	10.33
7	Nitrogen 60 kg/ha + Boron 3 kg/ha	123.98	83.67	1.90	19.55	10.34
8	Nitrogen 60 kg/ha + Boron 5 kg/ha	124.67	84.94	2.13	20.08	10.35
9	Nitrogen 60 kg/ha + Boron 7 kg/ha	125.32	85.96	2.17	20.19	10.36
10	Control (100:60:40 NPK kg/ha)	120.54	80.18	1.81	17.23	10.29
	F test	S	S	S	S	NS
	SEm(±)	0.35	0.35	0.05	0.06	0.16
	CD (P=0.05)	1.05	1.05	0.15	0.19	

Table 2. Effect of nitrogen and boron on yield attributes of babycorn.

	Treatment combinations	Cob yield without husk (kg/ha)	Cob yield with husk (kg/ha)
1	Nitrogen 40 kg/ha + Boron 3 kg/ha	1446.10	3033.59
2	Nitrogen 40 kg/ha + Boron 5 kg/ha	1471.99	3046.48
3	Nitrogen 40 kg/ha + Boron 7 kg/ha	1482.23	3094.69
4	Nitrogen 50 kg/ha + Boron 3 kg/ha	1459.04	3038.74
5	Nitrogen 50 kg/ha + Boron 5 kg/ha	1464.89	3041.66
6	Nitrogen 50 kg/ha + Boron 7 kg/ha	1473.61	3061.16
7	Nitrogen 60 kg/ha + Boron 3 kg/ha	1480.33	3091.21
8	Nitrogen 60 kg/ha + Boron 5 kg/ha	1491.61	3097.89
9	Nitrogen 60 kg/ha + Boron 7 kg/ha	1498.59	3110.46
10	Control (100:60:40 NPK kg/ha)	1427.41	3008.54
	F test	S	S
	SEm (±)	2.93	5.25
	CD (P=0.05)	8.78	15.72