Original Research Article

Effect of Nitrogen, Zinc and Iron on growth and yield of baby-corn (*Zea mays* L.)

ABSTRACT

A field experiment was conducted during *Zaid*, 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.2), organic carbon (0.73%), available N (265.23 kg/ha), available P (28.72 kg/ha), and available K (336 kg/ha). The treatments comprised of basal application of nitrogen and foliar application of zinc and iron. The experiment was laid out in Randomized Block Design with nine treatments each replicated thrice. The results showed that *viz:* Plant height (169.75 cm),Number of leaves per plant (13.80) plant dry weight (113.09 g/plant*)* were recorded significantly higher in 90kg/ha Nitrogen along with 0.5% Zinc and 0.2% Iron. Number of cobs per plant (1.69), cob length (18.50 cm), cob girth (8.10cm), cob weight with husk (48.85g), cob weight with out husk (13.80 g), cob yield with husk (11.75 t/ha), cob yield without husk (4.35 t/ha), green fodder (33.58t/ha) were recorded significantly higher in 90kg/ha Nitrogen along with 0.5% Zinc and 0.2%Iron. Thus, basal application of nitrogen along with foliar application zinc and iron could be a promising option for growth and yield enhancement in baby-corn.

***Keywords*:** *Nitrogen, Zinc, Iron, Baby-corn, Growth, and Yield.*

INTRODUCTION

Baby corn (*Zea mays* L.) is an important crop of Thailand, Taiwan and India;recently, baby corn has gained popularity in Delhi, Uttar Pradesh, Haryana, Maharashtra, Telangana, Karnataka, Andhra Pradesh and Rajasthan and Meghalaya states. Attention is now being paid to explore its potential in India for earning foreign exchange besides higher economic returns to the farmers. Baby corn is the de husked young cobs of harvested within 2-3 days of silk emergence and are consumed as vegetable due to its sweet flavour. The increase in production of baby corn is necessary to meet the demand of vegetable for the burgeoning population. For yield maximization per unit area to the fulfillment of vegetable requirement water and time is the possible answer. The earliness facilitates crop diversification, increase overall cropping intensity in a year and increases profitability.In the last decade, early harvesting of young corn, fresh, sweet and tender ears for vegetable purpose, which is called as baby corn **[1]**.

Nitrogen is the most important nutrient for the growth and yield of corn. Ideal nitrogen management optimizes grain yield, farm profit and nitrogen use efficiency, while it minimizes the potential for leaching of nitrogen, thus preventing environmental pollution. Hence, there is need to evaluate sweet corn varieties under optimum combination of nitrogen and phosphorus fertilization under prevailing agroclimatic conditions. Nitrogen is a vital plant nutrient and a major yield determining factor required for maize production **[2]**. Nitrogen is a component of protein and nucleic acids and when N is sub-optimal, growth is reduced **[3]**. Zinc deficiency in soils resulting in lower zinc content in grains and fodder **[4]**. Zinc exerts a great influence on basic plant life processes, such as (i) nitrogen metabolism – uptake of nitrogen and protein quality; (ii) photosynthesis – chlorophyll synthesis, carbon anhydrase activity; (iii) resistance to abiotic and biotic stresses – protection against oxidative damage **[5].** Iron play's significant role in various enzymatic and physiological activities of the plant. Iron catalyses the process of oxidation in plant cells and is vital for transformation of carbohydrates, regulates the consumption of sugar, increases source of energy for the production of chlorophyll, aids in the formation of auxins which produce more plant cells and

more dry matter, that in turn will be stored in seed as a sink and promotes absorption of water. Therefore, the present investigation to study the Effect of Nitrogen, Zinc and Iron on growth and yield of baby corn (*Zea mays* L.).

MATERIALS AND METHODS

A field trial was conducted during *Zaid,* 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) which is located at 25°39"42" N latitude, 81°67"56" E longitude, and 98m altitude above the mean sea level (MSL). The soil was sandy loam in texture, low in organic carbon and medium in available nitrogen, phosphorus, and low in potassium. Nutrient sources were Single Super Phosphate, and Murate of potash to fulfill the requirement of Phosphorus, and Potassium. The nitrogen was applied in 70, 80, 90 kg/ha. The experiment was laid out in Randomized Block Design with ten treatments each replicated thrice.

Table 1. treatments combinations are;

1- 70kg/ha Nitrogen + 0.5% Zinc
2- 70kg/ha Nitrogen + 0.2% Iron
3- 70kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]
4- 80kg/ha Nitrogen + 0.5% Zinc
5- 80kg/ha Nitrogen + 0.2% Iron
6- 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]
7- 90kg/ha Nitrogen + 0.5% Zinc
8- 90kg/ha Nitrogen + 0.2% Iron
9- 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]

Blanket application of a recommended dose of Phosphorus and Potassium (0:60:40 NPK kg/ha). The date of sowing was 27th February 2022 with the seed rate of 20kg/ha. The growth parameters reading such as plant height, number of leaves per plant, plant dry weight and also, yield parameters such as number of Cob per plant, cob length, cob weight, and cob yield. These parameters were recorded and statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design **[6].**

RESULTS AND DISCUSSION

Effect on the growth of baby-corn. As can be seen in Table 2, growth parameters are summarized statistically. At 60 DAS, significantly taller plant height (169.75 cm) was recorded with application of 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. There was no significant difference among the treatments. At 60 DAS, the maximum number of leaves per plant was recorded in the treatment combination of 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] (13.80). The minimum plant height was recorded in the treatment combination of 70kg/ha Nitrogen + 0.5% Iron which is 10.27. At 60 DAS, significantly plant dry weight (113.09 g/plant) was recorded with application of 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. The result demonstrates that **[7]** reported that application of 100,125 and 150 per cent of recommended

dose of NPK (120: 40: 30 Kg ha^{-1}) resulted in significant improvement in plant height and dry matter accumulation rate in baby corn with increasing level of NPK. **[8]** reported that Application of 1.5% Zinc concentration recorded maximum plant height and number of cobs. **[9]** reported that increase in nitrogen dose up to 120 kg N ha^{-1} resulted in significantly higher leaf area of baby corn as compared to 80 and 60 kg N ha^{-1}. **[10]** Iron was found significant in respect of green and dry matter yield. And significant increases in shoot dry weight by Fe application under both aerobic and flooded plots. **[11]** also reported significant increase in growth parameters of baby corn viz., plant height, LAI and dry matter percentage with increase in the level of nitrogen application.

Table 2. Effect of Nitrogen, Zinc and Iron on growth of baby corn

Treatment combination	Plant height (cm)	Number of leaves per plant	Plant dry weight (g/plant)
1	147.90	10.40	91.01
2	145.36	10.27	90.53
3	157.80	11.40	98.38
4	160.56	12.20	100.40
5	153.74	11.34	93.88
6	166.66	12.40	107.49
7	167.37	12.80	111.63
8	162.61	12.27	104.01
9	169.75	13.80	113.09
F-test	S	S	S
SEm(±)	1.35	0.10	1.55
CD 5%	4.06	0.30	4.66

Table 3. Effect of Nitrogen, Zinc and Iron on yield of baby corn

Treatment combination	Cobs/ plant	Cob Length (cm)	Cob Girth (cm)	Cob weight (g)		Cob yield (t/ha)		Green Fodder Yield (t/ha)
				Without husk	With husk	Without husk	With husk	
1	1.39	14.59	6.56	11.54	41.49	2.85	9.64	27.10
2	1.26	13.06	5.44	10.57	39.85	2.55	8.90	25.71
3	1.46	15.96	7.28	12.20	46.40	3.30	10.30	30.37
4	1.48	15.40	7.45	12.27`	44.41	3.61	10.37	32.04
5	1.42	14.76	6.76	11.90	43.28	3.15	10.00	28.87
6	1.53	17.40	7.69	12.53	47.61	3.95	11.32	32.44
7	1.66	18.20	8.03	13.60	48.72	4.25	11.56	33.25
8	1.62	17.34	7.66	13.40	47.79	3.90	10.63	31.66
9	1.69	18.50	8.10	13.80	48.85	4.35	11.75	33.58
F-test	S	S	S	S	S	S	S	S
SEm(±)	0.06	0.73	0.27	0.28	1.53	0.20	0.54	0.97
CD 5%	0.18	2.19	0.82	0.85	4.59	0.61	1.62	2.92

Effect on the yield of baby-corn. As can be seen in Table 3, yield parameters are summarized statistically. At harvest, significantly maximum number of cobs (1.69) per plant recorded in 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 90kg/ha Nitrogen + 0.2% Iron, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. At harvest, significantly maximum cob length (18.50 cm) per plant recorded in 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 90 kg/ha Nitrogen + 0.2% Iron statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. At harvest, significantly maximum cob girth (8.10 cm) per plant recorded in 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 90kg/ha Nitrogen + 0.2% Iron statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] at harvest, significantly maximum cob weight with husk (48.85g) recorded in 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 90kg/ha Nitrogen + 0.2% Iron, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. At harvest, significantly maximum cob weight without husk (13.80g) recorded in 90kg/ha Nitrogen + 0.5% Zinc. However, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 80kg/ha Nitrogen + 0.5% Zinc, 90kg/ha Nitrogen + 0.2% Iron, 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] statistically at par with 90kg/ha Nitrogen + 0.5% Zinc. At harvest, significantly maximum cob yield with husk (11.75 t/ha) recorded in 90kg/ha Nitrogen + + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc ,80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 90kg/ha Nitrogen + 0.2% Iron statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. At harvest, significantly maximum cob yield without husk (4.35 t/ha) recorded in 90kg/ha Nitrogen + + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 90kg/ha Nitrogen + 0.2% Iron statistically at par with 90kg/ha Nitrogen+ [0.5% Zinc + 0.2% Iron]. At harvest, significantly maximum green fodder yield (33.58 t/ha) recorded in 90kg/ha Nitrogen + + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 80kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 80kg/ha Nitrogen + 0.5% Zinc statistically at par with 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron].The result demonstrates that **[12]** Number of cobs per plant may also be increased by iron foliar spray which helps inoculant for increasing iron transportation in maize plant. **[13]** The foliar application of ferrous sulphate increased cob length as it plays

critical role in metabolic processes such as DNA synthesis. **[14]** concluded that application of 0.2% Iron concentration recorded maximum Dry weight, Number of cobs per plant, cob length, cob girth, cob weight without husk, and cob yield without husk.

CONCLUSION

In conclusion, the treatment 9 combination of 90kg/ha Nitrogen along with 0.5% Zinc and 0.2% Iron was found to be more productive and also economically feasible.

REFERENCES

Ramchandrappa BK, Nanjappa HV, Thimmegowda MN, Soumya TM. Production management for profitable baby corn cultivation. Indian Farming. 2004; 42:25-27.

Shanti KVP, Rao MR, Reddy MS, Sarma RS (1997). Response of maize (Zea mays) hybrid and composite to different levels of nitrogen. Indian J. Agric. Sci. 67: 424-425.

Haque MM, Hamid A, Bhuiyan NI. Nutrient uptake and productivity as affected by nitrogen and potassium application levels on maize/sweet potato intercropping system. Korean J Crop Sci., 2001; 46(1):1-5.

Rashid A, Ryan J. Micronutrients constraints to crop production in soils with Mediterranean-type characteristics: A review. Journal of Plant Nutrition. 2004; 27(6):959-75.

Alloway, B. (2004). Zinc in soils and crop nutrition. Areas of the World with Zinc Deficiency Problems. Available at: http://www.zinc crops.org/Crops/Alloway-all.php. Accessed in March 24, 2016.

Gomez, K.A., and A.A. Gomez. Statistical procedures for agricultural research. John Wiley and Sons, New York, 1984;680p.

Dadarwal, R. S., Jain, N. K. and Singh, D. 2009. Integrated nutrient management in baby corn (Zea mays). Indian Journal of Agricultural Sciences 79(12): 1023– 1025.

Vikram Singh, Shalini Roy. 2019. Effect of nitrogen and zinc levels on growth, yield and economics of baby corn (Zea mays L.). Journal of Pharmacognosy and Phytochemistry, 8(4): 1577-1580.

Rakib, M., Banerjee, M. and Malik, G. C. 2011. Effect of integrated nutrient management on biometric parameters, yield parameters and economics of baby corn (Zea mays L.). International Journal of Agriculture, Environment & Biotechnology: 21- 26.

Xiaoyun Fan, RezaulKarim MD, Xinping C, Yueqiang Z, Xiaopeng G, Fusuo Z et al., 2012. Growth and iron uptake of lowland and aerobic rice genotypes under flooded and aerobic cultivation. Communications in Soil Science and Plant Analysis, 43(13):1811-1822.

Thavaprakaash, N. and Velayudham, K. 2009. Influence of crop geometry, intercropping system and INM practices on productivity of baby corn (Zea mays L.) based intercropping. Mysore Journal of Agricultural Sciences 43(4):686 – 695.

Gamboa D, Perez FR and Arevalo CG. 1990. Sweet corn evaluation of cultivars introduced by the E.E.A.D.C., Advance agro-industrial; 1: 23-24.

Gnanasundari R, Sellamuthu K.M and Malathi P. 2018.Effect of Potassium on Growth, Yield and NPK Uptake of Hybrid Maize in Black Calcareous Soil. Madras Agricultural Journal, 10(2): 218.

Ramya. 2020. Effect of Potassium and Iron on Growth and Yield of Summer Baby corn (Zea mays L.) International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Volume 9 Number.