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Effect of Nitrogen, Zinc and Iron on Growth and Yield of Baby-corn (*Zea mays* L.) Prayagraj Condition

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted at the Crop Research Farm (CRF), Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (UP) during the year 2021 zaid season. To find out suitable Nitrogen, zinc and iron levels for profitable baby corn yield. The experiment comprised of 9 treatments with different combinations of nitrogen, zinc and iron replicated thrice in a Randomized Block Design. The main objective of the experiment was to evaluate the Effect of Nitrogen, Zinc and Iron on growth and yield of baby-corn (*Zea mays* L.). The nitrogen levels include [70, 80 and 90 kg/ha] where-as levels of zinc (0.5%) and iron (0.2%) From the present investigation 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) and the profitable production of baby corn can be secured by 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron].

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1. INTRODUCTION

Baby corn, a novel utilization of maize, is used as a vegetable in many Asian countries. It is used as an ingredient in the preparation of many food items. It refers to whole, entirely edible corn of immature cob harvested just before fertilization at the silk emergence stage [1] Das et al. [2] reported that 100g of baby corn contained 89.1 g moisture, 0.2 g fat, 1.9 g protein, 8.2 mg. carbohydrate, 0.06 g ash, 28.0 mg calcium, 86.0 mg phosphorus, and 11.0 mg of ascorbic acid.

Nitrogen plays an important role in synthesis of chlorophyll and amino acids that contribute to the building unit of protein and thus, growth of plants. Nitrogen helps in early establishment of leaf area capable of photosynthesis. Nitrogen promotes leaf and stem growth rapidly which consequently increase the yield and its quality [3]. Maize seed priming with $ZnSO_4$ not only enhanced plant growth but also increased the final grain yield and seed Zn contents in plants grown on soil with limited Zn availability [4]. iron is involved in the synthesis of chlorophyll, and it is essential for the maintenance of chloroplast structure and function. Foliar feeding is a new and controversial technique of feeding plants by applying liquid fertilizer directly to their leaves [5].

2. MATERIALS AND METHODS

The current study was carried out in the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, during the zaid season 2021-22, (U.P.). The experimental field coordinates are 25.4089833, 81.8530037 and it is located approximately 9 kilometers from Prayagraj city, near the Yamuna River, on the left side of the Prayagraj-Rewa Road. Prayagraj is located in the subtropical zone of Uttar Pradesh, with hot summers and pleasant winters. The area's average temperature is 23°C to 38°C, with temperatures seldom dropping below 3°C or 4°C. The relative humidity levels range from 26% to 78%. In this location, the average annual rainfall is 1050 mm. The soil chemistry analysis revealed a sandy loam texture with a pH of 7.2, low amounts of organic carbon (0.48 percent) and potassium (215.4 kg/ha), and a low quantity of accessible phosphorus (13.6 kg/ha). The soil was electricallyconductive and had a conductivity of 0.26 dS/m. The experiment was laid out in Randomized Block Design with nine treatments each replicated thrice. The zinc (0.5%) was taken as 5gm/1000ml, and Iron (0.2%) was taken as 2gm/1000ml. The experiment details and treatment combinations are shown in Tables 1, 2 and 3 respectively. Nitrogen, zinc and iron were maintained according to the treatment combinations were all successfully measured, and an economic analysis of each treatment was completed to determine the best treatment combination for baby corn cultivation. The statistics were calculated and analysed using the S. Sreethu et al. [6] statistical approach which is one way annova table used to compare more than two groups based on one factor with F probability of 0.005% developed by Ronald Fisher in 1918.

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]

3. RESULTS AND DISCUSSION

3.1 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]. 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.The 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 results demonstrated that application of 100, 125 and 150 per cent of recommended dose of NPK (120: 40: 30 Kg ha^{-1}) resulted in significant improvement which nitrogen promotes leaf, stem growth rapidly which consequently increase in plant height, and dry matter accumulation rate in baby corn with increasing level of NPK [7], and [8]. Zinc enhances Carbohydrate, protein, and chlorophyll formation Therefore, a constant and continuous supply of zinc helps for optimum growth and maximum yield. The application of 1.5% Zinc concentration recorded maximum plant height and number of cobs [9]. The 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. The application of 120 kg N ha-1 recorded maximum plant height and number of cobs Shalini Roy et al., (2019).

3.2 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, 80 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] statistically at par with 90 kg/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 (48.85 g) recorded in 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90 kg/ha Nitrogen + 0.5% Zinc, 90 kg/ha Nitrogen + 0.2% Iron, 80 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] statistically at par with 90 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. At harvest, significantly maximum cob weight without husk (13.80g) recorded in 90 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. However, 90kg/ha Nitrogen + 0.5% Zinc, 90kg/ha Nitrogen + 0.2% Iron, 80 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron] statistically at par with 90 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. At harvest, significantly maximum cob yield with husk (11.75 t/ha) recorded in 90 kg/ha Nitrogen + + [0.5% Zinc + 0.2% Iron]. However, 90 kg/ha Nitrogen + 0.5% Zinc ,80 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 90 kg/ha Nitrogen + 0.2% Iron statistically at par with 90 kg/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, 80 kg/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 green fodder yield (33.58 t/ha) recorded in 90kg/ha Nitrogen + + [0.5% Zinc + 0.2% Iron]. However, 90 kg/ha Nitrogen + 0.5% Zinc, 80 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron], 80 kg/ha Nitrogen + 0.5% Zinc statistically at par with 90 kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron].

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

The result demonstrates that Number of cobs per plant may also be increased by iron foliar spray which helps inoculant for increasing iron transportation in maize plant. Gamboa et al. [10]. The foliar application of ferrous sulphate increased cob length as it plays critical role in metabolic processes such as DNA synthesis Gnanasundari et al. [11]. The 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. Ramya et al. [12]. As compared to previous researchers' applications, the yield was higher because they did not combine zinc and iron. In their case, 120 kg nitrogen and 1.5% zinc yielded 7.26 t/ha with husk, while we used 90 kg nitrogen and 0.5% zinc and 0.2% iron, increasing the yield to 11.75 t/ha.

4. CONCLUSION

The combination of application of 90kg/ha Nitrogen + [0.5% Zinc + 0.2% Iron]. proved to be the most advantageous to farmers, resulting in 169.75cm plant height, number of leaves 13.80, cob length 18.50(cm), cob girth 8.10(cm), cob weight with husk 48.85(g), cob yield with husk 11.75(t/ha) and cob yield without husk 4.35 (t/ha) green fodder 33.58 (t/ha) respectively.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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