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Effect of Phosphorus and Zinc on Growth and Yield of Baby Corn (*Zea mays* L.)

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Original Research Article

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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. The experiment comprised of 9 treatments with different combinations of phosphorus and zinc levels replicated thrice in a Randomized Block Design. The main objective of the experiment was to evaluate the Effect of phosphorus and zinc levels on growth and yield of Babycorn (*Zea Mays* L.). The phosphorus levels include (50, 60 and 70 kg/ha) and levels of zinc include (05, 15, 25 kg/ha). From the present investigation the profitable production of baby corn can be secure with application of phosphorus (70 kg/ha) and zinc (25 kg/ha).

Keywords: Phosphorus; zinc; growth and yield; baby corn.

1. INTRODUCTION

In addition to its diversified uses, maize is highly valued as animal feed, human food, and raw material in the industry. Next to rice and wheat, maize is the third most important cereal crop and has the highest production potential. Growing 'baby corn' for vegetable purposes is one recent development to diversify and add value to the food processing industry. A young, fresh, and finger-like green ear is harvested when the silk length is 2-3 cm, but before fertilization [1].

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"Phosphorus is the second most important mineral nutrient after nitrogen. In terms of quantitative requirements for plants. It is necessary for growth, sugar and starch utilization, Photosynthesis, nucleus formation, cell division, fat and albumin production. Energy derived as a result of photosynthesis and carbohydrate metabolism, phosphate compounds store energy use in growth and reproduction" [2]. In plants, it is readily translocated from older to younger tissues as roots, stems, and leaves are formed. An adequate amount of P promotes rapid growth and earlier maturity, as well as improving the quality of vegetative growth. Deficiency of phosphorus results in crooked rows and small ear numbers in maize as the kernel twists.

In addition to lipids, proteins, and cofactors of auxins, it also plays an important role in the metabolism of nucleic acids Mengel et al. [3]. The application of zinc has been proven to improve crop yields and quality Hassan et al. [4]. Mousavi et al. [5] show that its deficiency reduces yields and deteriorates crop quality. In addition, higher Zn concentrations suppress cell differentiation and elongation, affecting biomass production Tsonev et al. [6].

2. MATERIALS AND METHODS

The research was conducted at the Crop Research Farm, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, during the Zaid season 2021-22. It is located approximately 9 kilometers from Prayagraj city, near the Yamuna River, on the left side of the Prayagraj-Rewa Road, at 25.4089833, 81.8530037. The subtropical region of Uttar Pradesh, where Prayagraj is located, has scorching summers and mild winters. The annual rainfall here seems to be 1050 mm on average. "The data of the soil chemistry examination showed that the soil had a sandy loam texture, a pH of 7.2, small amounts of organic carbon (0.48 percent) and potassium (215.4 kg/ha), and small amounts of phosphorus that was easily accessible (13.6 kg/ha). The soil had a conductivity of 0.26 dS/m and was electrically conductive. Three replications have been used for every one of the nine treatment combinations. Tables 1 and 2 show the treatment details and treatment combinations, respectively. Phosphorus and zinc levels were maintained in accordance with the treatment combinations, and an analysis of each treatment was completed to determine the best treatment combination for Babycorn cultivation". The statistics were calculated and analysed using Sunnam Hemanth Kumar [7] statistical approach, which is a one-way annova table used to compare more than two groups based on one factor with a F probability of 0.005% which was developed by Ronald Fisher in 1918.

3. RESULTS AND DISCUSSION

Data presented in Table 1 and Table 2 indicates significant increases in all growth parameters in baby corn at harvest, including plant height and dry weight per plant. Application of phosphorus 70 kg/ha and zinc 25kg/ha significantly increased yields, and remained at par with with 60 kg/ha Phosphorus + 25 kg/ha Zinc and 70 kg/ha Phosphorus + 15 kg/ha Zinc results showed that significantly maximum plant dry weight 105.37 g/plant, highest plant height 158.17 cm, maximum Cobs/Plant (1.46), Length of Cob/plant (17.30 cm), Girth of Cob/plant (7.28 cm), Cob weight with husk (63.01 g), cob weight without husk (20.65 g), cob yield with husk (13.30 t/ha), Cob yield without husk (5.16 t/ha) at harvest. "Phosphorus P application increased plant height, dry weight, and number of cobs per plant, which could be attributed to improved early vegetative growth in terms of increased leaf area, dry matter accumulation, and a vigorous root system, which increased the number of cobs" Masood et al. [8] found similar findings. "The source and sink relationship is responsible for the increase in cob yield caused by phosphorus application. It appears that increased photosynthate translocation from source to sink may have increased cob yield. Phosphorus increases yield due to its well-developed root system, increased N fixation and availability to plants, and favourable rhizosphere environments" Hirpara et al. [9] discovered similar results. "Zinc plays an important role in plant metabolism by influencing the activity of growth enzymes. It is also involved in carbohydrate metabolism, maintaining the integrity of protein synthesis, cellular membranes and regulation of auxin synthesis and pollen formation, which causes a greater number and length of cobs" The findings were found to be similar to that of [10]. "The production of photosynthetic pigments and their transport to sinks is dependent on the presence of mineral nutrients, which has increased zinc uptake. Most photosynthetic pathways rely on enzymes and co-enzymes that are synthesised by mineral nutrients, and zinc application resulted in higher

Table 1. Effect of Phosphorus and Zinc levels on growth attributes in Baby corn

S.No	Treatments	Plant height	Plant Dry weight
1	50 kg/ha Phosphorus + 5 kg/ha Zinc	153.70	102.72
2	50 kg/ha Phosphorus + 5 kg/ha Zinc	154.24	103.04
3	50 kg/ha Phosphorus + 25 kg/ha Zinc	156.25	104.10
4	60 kg/ha Phosphorus + 5 kg/ha Zinc	155.19	103.42
5	60 kg/ha Phosphorus + 15 kg/ha Zinc	156.80	104.26
6	60 kg/ha Phosphorus + 25 kg/ha Zinc	157.73	105.14
7	70 kg/ha Phosphorus + 5 kg/ha Zinc	155.84	103.71
8	70 kg/ha Phosphorus + 15 kg/ha Zinc	157.54	104.65
9	70 kg/ha Phosphorus + 25 kg/ha Zinc	158.17	105.37
	F test	S	S
	SEm (±)	0.26	0.25
	CD (P = 0.05)	0.77	0.74

Table 2. Effect of Phosphorus and Zinc levels in yield attributes in Baby corn

S.No	Treatments	No. of Cobs/plant	Cob weight (g)		Cob yield (t/ha)		B:C ratio
			With Husk	Without Husk	With Husk	Without Husk	
1.	50 kg/ha Phosphorus + 5 kg/ha Zinc	1.12	60.93	17.63	11.75	3.73	1.27
2.	50 kg/ha Phosphorus + 15 kg/ha Zinc	1.16	60.75	18.42	12.03	3.93	1.32
3.	50 kg/ha Phosphorus + 25 kg/ha Zinc	1.29	61.78	19.47	12.72	4.48	1.70
4.	60 kg/ha Phosphorus + 5 kg/ha Zinc	1.21	61.06	18.79	12.28	4.14	1.46
5.	60 kg/ha Phosphorus + 15 kg/ha Zinc	1.33	62.20	19.78	12.88	4.60	1.80
6.	60 kg/ha Phosphorus + 25 kg/ha Zinc	1.41	62.84	20.39	13.16	5.01	1.97
7.	70 kg/ha Phosphorus + 5 kg/ha Zinc	1.25	61.42	19.17	12.48	4.30	1.63
8.	70 kg/ha Phosphorus + 15 kg/ha Zinc	1.37	62.49	20.14	13.09	4.83	1.88
9.	70 kg/ha Phosphorus + 25 kg/ha Zinc	1.46	63.01	20.65	13.30	5.16	2.08
F test		**S**	**S**	**S**	**S**	**S**	
SEm (±)		0.03	0.21	0.18	0.07	0.12	
CD (P = 0.05)		0.09	0.63	0.55	0.21	0.36	

chlorophyll contents, synthesis of metabolites and growth-regulating substances, oxidation and metabolic activities, and ultimately better crop growth and development, which resulted in an increase in yield attributes of baby corn". These findings are consistent with those of [11] and [12].

3.1 Benefit Cost Ratio

In Table 2 The data presented in Table 2 shows that benefit cost ratio (2.08) as influenced by different phosphorus and zinc levels in baby corn was found to be highest in treatment-9 with application of 70 kg/ha Phosphorus and 25 kg/ha Zinc and the minimum benefit cost ratio (1.27) was found to be in treatment-9 (application of 50 kg/ha Phosphorus and 25 kg/ha Zinc) as compared to other treatments.

4. CONCLUSION

Based on the findings of this study, it is concluded that the profitable production of Baby corn can be ensured by applying phosphorus 70 kg/ha and zinc 25 kg/ha at the agroclimatic zone in Prayagraj, Uttarpradesh state, INDIA. These practises could be passed on to farmers in the Prayagraj, Uttarpradesh agroclimatic zone to boost their yields. Since the findings have been based on a single season of research.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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