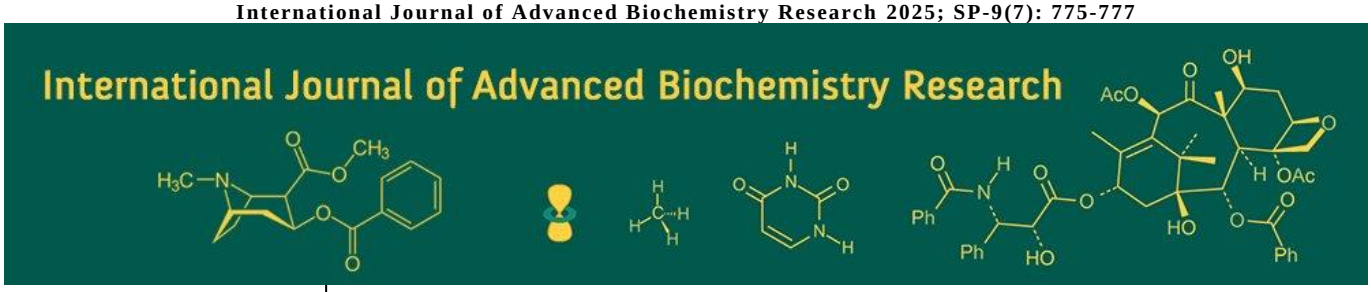

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Effects of foliar application of zinc and boron on growth of foxtail millet (*Setaria italica* L.)

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Abstract
An investigation was conducted using ten treatments Analysis of variance revealed significant differences among the genotypes for all the traits studied. with various combinations of zinc and boron concentrations. The plot size of individual treatment was 2.1 m x 3 m. Seeds were sown at the rate of 8 kg ha^{-1} at spacing 45 cm x 10 cm. Ten treatments viz., T_1 (Zn 0.50% + B 0.50%), T_2 (Zn 0.50% + B 1.00%), T_3 (Zn 0.50% + B 0.50%), T_4 (Zn 1.00% + B 0.50%), T_5 (Zn 1.00% + B 1.00%), T_6 (Zn 1.00% + B 1.50%), T_7 (Zn 1.50% + B 0.50%), T_8 (Zn 1.50% + B 1.00%), T_9 (Zn 1.50% + B 1.50%) and T_{10} (control) were tested. Foliar application of Zinc and Boron were given at two growth stages of foxtail millet.
The research conducted with the aimed to evaluate the effects of zinc and boron on growth and yield of Foxtail millet and to work out the economics of foliar application of zinc and boron on Foxtail millet. The result of present investigation revealed that the treatment T_5 (Zn 1.00% + B 1.00%) enhances significantly the growth parameters viz., plant height, plant dry weight, number of tillers $hill^{-1}$ and leaf area.

Keywords: Foxtail millet, foliar application, micronutrient application

Introduction
Foxtail Millet (*Setaria italica* L.) one of the oldest of the cultivated millets in the world is cultivated in about 23 countries in Asia, Africa and America. It belongs to the family Poaceae (Graminae). It is also known as Italian millet and German millet. It is generally grown as a rainfed crop in India. It has erect leafy stem that grow 60-75 cm tall and bend quite a bit at maturity due to heavy weight of earhead. It is a self-pollinating, short duration, C_4 cereal, good as food for human consumption, feed for poultry and cage birds, and fodder for cattle. Foxtail millet ranks second among the millets production in the world and continues to have an important place in the world agriculture providing food to millions of people dependent on poor or marginal soils in southern Europe and in temperate, subtropical and tropical Asia.
Of late, the importance of foxtail millet is recognized as diabetic food. It is rich in dietary fiber, minerals, micronutrients, protein, and has low glycemic index (GI). Unlike rice, foxtail millet releases glucose steadily without affecting the metabolism of the body. The incidence of diabetes is found to be rare among the population consuming foxtail millet diet.
Zinc is an essential trace element for the growth and development of plants, humans and animals. Zinc deficiency is one of the most important reasons affecting human health. The growth and immune system of humans can be impaired by Zn deficiency. Zinc deficiency in soils may reduce yield and quality of the crop. Boron is an essential micronutrient for plant growth, seed development and crop yield. Although cereals and millets generally less sensitive to B deficiency than pulses. Millets grains can accumulate more amount of zinc and boron compared to cereals. Hence research will be conducted to find the response of foxtail millet to different levels of zinc and boron application. Boron is crucial for several physiological functions in plants, including cell expansion, cellular reproduction, seed germination, pollen grain growth, nutrient transport, hormone mobility within the plant, lignin formation, cell development, growth of meristematic tissue, and protein creation. Applying boron to foxtail millet is necessary to enhance its growth, development, and overall yield.

Materials and Methods

An investigation was conducted using ten treatments with various combinations of zinc and boron concentrations. The plot size of individual treatment was 2.1 m x 3 m. Seeds were sown at the rate of 8 kg ha^{-1} by dibbing method of sowing at spacing 45 cm x 10 cm. There were three replications and ten treatments viz., T_1 (Zn 0.50% + B 0.50%), T_2 (Zn 0.50% + B 1.00%), T_3 (Zn 0.50% + B 1.50%), T_4 (Zn 1.00% + B 0.50%), T_5 (Zn 1.00% + B 1.00%), T_6 (Zn 1.00% + B 1.50%), T_7 (Zn 1.50% + B 0.50%), T_8 (Zn 1.50% + B 1.00%), T_9 (Zn 1.50% + B 1.50%) and T_{10} (control) were tested. Foliar application of Zinc and Boron were given at two stages i.e., tillering stage and pre-flowering stage of foxtail millet

Five plants per treatment were randomly selected in each replication for recording observations, and their average values were used for statistical analysis. Data were collected on plant height, plant dry weight, number of tillers $hill^{-1}$ and leaf area. Analysis of variance and summary statistics were done as per Panse and Sukhatme (1967). Observations for these parameters were taken at 20, 40, 60 and 80 DAS.

Results and Discussions

The result of present investigation revealed that the treatment T_5 (Zinc 1.00% + Boron 1.00%) improved the growth parameters *viz*., plant height, dry weight, no. of tillers, leaf area by foliar application in Foxtail millet variety PDKV Yashashree.

Observations recorded at 20 DAS were found non significant because foliar spray given at tillering and pre-flowering stage of foxtail millet.

Growth parameter in term of plant height of foxtail millet was noted at 20, 40, 60 and 80 Das. The plant height significantly increased by application of different concentrations of foliar application of zinc and boron. Among the treatments plant height was maximum due to foliar application of T_5 (Zinc 1.00% + Boron 1.00%) However, it was at par with treatments T_8 (Zinc 1.50% + Boron 1.00), T_9 (Zinc 1.50% + Boron 0.50%) and T_6 (Zinc 1.50% + Boron 1.50%). These treatments were found superior to increase plant dry weight when compared with treatment T_{10} (control) and rest of the treatments.

Plant dry weight increased significantly over control due to foliar application of Zinc and Boron. Significantly, highest leaf area $plant^{-1}$ found in treatment T_5 (Zinc 1.00% + Boron 1.00%) However, it was at par with treatments T_8 (Zinc 1.50% + Boron 1.00), T_9 (Zinc 1.50% + Boron 0.50%) and T_6 (Zinc 1.50% + Boron 1.50%). These treatments were found superior to increase plant dry weight when compared with treatment T_{10} (control) and rest of the treatments.

Number of tillers $hill^{-1}$ increased significantly over control due to foliar application of Zinc and Boron. Significantly, highest number of tillers $hill^{-1}$ found in treatment T_5 (Zinc 1.00% + Boron 1.00%) However, it was at par with treatments T_8 (Zinc 1.50% + Boron 1.00), T_9 (Zinc 1.50% + Boron 0.50%) and T_6 (Zinc 1.50% + Boron 1.50%). These treatments were found superior to increase number of tillers $hill^{-1}$ when compared with treatment T_{10} (control) and rest of the treatments.

Leaf area increased significantly over control due to foliar application of Zinc and Boron. Significantly, highest leaf area plant-1 found in treatment T_5 (Zinc 1.00% + Boron 1.00%) However, it was at par with treatments T_8 (Zinc 1.50% + Boron 1.00), T_9 (Zinc 1.50% + Boron 0.50%) and T_6 (Zinc 1.50% + Boron 1.50%). These treatments were found superior to increase leaf area when compared with treatment T_{10} (control) and rest of the treatments.

Table 1: Effect of foliar application of Zinc and Boron on plant height and plant dry weight in foxtail millet

Treatments	Plant height (cm)				Plant dry weight (g)			
	20 DAS	40 DAS	60 DAS	80 DAS	20 DAS	40 DAS	60 DAS	80 DAS
T_1 (Zn 0.50% + B 0.50%)	15.29	51.02	77.12	88.71	0.512	4.95	10.98	14.90
T_2 (Zn 0.50% + B 1.00%)	16.60	51.02	76.28	87.57	0.521	4.90	10.85	15.42
T_3 (Zn 0.50% + B 0.50%)	15.74	51.30	77.76	87.73	0.472	5.02	11.13	15.82
T_4 (Zn 1.00% + B 0.50%)	17.20	54.66	76.88	93.77	0.516	5.28	11.71	16.56
T_5 (Zn 1.00% + B 1.00%)	16.63	57.76	85.95	101.96	0.539	5.59	12.33	17.26
T_6 (Zn 1.00% + B 1.50%)	17.09	56.24	84.58	94.82	0.513	5.35	11.85	16.84
T_7 (Zn 1.50% + B 0.50%)	15.68	56.22	81.64	93.59	0.494	5.21	11.56	16.42
T_8 (Zn 1.50% + B 1.00%)	17.14	57.12	85.09	100.93	0.544	5.56	12.09	17.21
T_9 (Zn 1.50% + B 1.50%)	18.18	56.99	83.82	98.86	0.556	5.45	12.08	17.11
T_{10} (control)	15.79	46.40	72.11	82.29	0.510	4.52	10.03	14.15
GM	16.53	53.87	80.12	93.02	0.52	5.18	11.46	16.17
SE(m)±	1.25	2.38	2.99	4.04	0.03	0.21	0.45	0.68
CD at 5%	NS	7.07	8.90	12.02	NS	0.63	1.33	2.02

Table 2: Effect of foliar application of Zinc and Boron on number of tillers $hill^{-1}$ and leaf area in foxtail millet

Treatments	Number of tillers per hill			Leaf area $plant^{-1}$(dm^2)			
	40 DAS	60 DAS	80 DAS	20 DAS	40 DAS	60 DAS	80 DAS
T_1 (Zn 0.50% + B 0.50%)	1.07	3.13	3.33	0.86	1.58	4.38	3.44
T_2 (Zn 0.50% + B 1.00%)	1.27	3.07	3.27	0.88	1.56	4.39	3.45
T_3 (Zn 0.50% + B 0.50%)	1.20	3.00	3.20	0.88	1.60	4.57	3.55
T_4 (Zn 1.00% + B 0.50%)	1.27	3.07	3.27	0.83	1.69	4.63	3.63
T_5 (Zn 1.00% + B 1.00%)	1.80	3.73	3.93	0.84	1.79	5.10	3.96
T_6 (Zn 1.00% + B 1.50%)	1.33	3.20	3.40	0.85	1.71	5.00	3.82
T_7 (Zn 1.50% + B 0.50%)	1.13	3.00	3.20	0.89	1.67	4.94	3.53
T_8 (Zn 1.50% + B 1.00%)	1.60	3.40	3.60	0.87	1.77	5.07	3.88
T_9 (Zn 1.50% + B 1.50%)	1.53	3.33	3.53	0.89	1.74	5.05	3.85
T_{10} (control)	0.67	2.87	3.07	0.88	1.44	4.35	3.18
GM	1.29	3.18	3.38	0.90	1.65	4.75	3.63
SE(m)±	0.10	0.14	0.14	0.04	0.07	0.20	0.15
CD at 5%	0.30	0.43	0.43	NS	0.20	0.59	0.45

Conclusion

Based on the results of the study conducted to evaluate effect of foliar application of Zinc and Boron on growth and yield of foxtail millet, the following conclusions were drawn:

1. The result of present investigation revealed that the growth parameters can be improved by foliar application of zinc and boron micronutrients in foxtail millet at tillering and pre-flowering stage.
2. Foliar spray treatment T_5 (Zinc 1.00% + Boron 1.00%) enhance significantly higher plant height, dry weight, no. of tillers per hill, leaf area followed by treatment T_8 (Zinc 1.50% + Boron 1.00%).

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References

1. Dholariya HP, Zinzala VJ, Patel JV, Patel VM. Zinc nutrition in finger millet (*Eleusine coracana* (L.) Gaertn.) for better nutritional security. International Journal of Current Microbiology and Applied Sciences. 2020;Special Issue-11:1082-1086.
2. Jaison M, Pilli K, Harish SG, Chikkaramappa T. Response of foxtail millet to application of zinc and boron in Alfisols of Karnataka. International Journal of Chemical Studies. 2018;6(6):2658-2661.
3. Shankar MA, Thimmegowda MN, Bhavitha NC, Manjunatha BN. Comparative efficiency of soil and foliar application of boron on growth and yield of finger millet (*Eleusine coracana*). Mysore Journal of Agricultural Sciences. 2017;51(2):430-435.
4. Kruthika NS, Mehera B, Kumar P. Effect of nano zinc and foliar application of boron on growth and field of finger millet (*Eleusine coracana*). International Journal of Environment and Climate Change. 2023;13(7):103-109.
5. Manjunath NS, Debbarma V. Effect of zinc and boron on growth, yield and economics of finger millet (*Eleusine coracana*). International Journal of Plant & Soil Science. 2023;35(18):1497-1503.