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Response of foliar application of zinc and boron on growth and yield of chilli (*Capsicum annuum* L.) cv. NP.46A

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Abstract
To study the response of different concentration of zinc and boron alone and in different combination on chilli cv. NP.46A revealed that the treatment combination have great influence on the growth and yield of chilli as compared to control, Combined spraying of 0.75% Zn and 0.25% boron twice at 45 and 65 days after transplanting gave maximum green as well as dry yield. Spraying of 0.75% zinc alone was also found to be effective in improving the growth and yield.

Keywords: chilli, micronutrient, growth and yield, economics, zinc and boron etc.

Introduction
Chilli (*Capsicum annuum* L.), one of the major spices grown in India, is a very useful and valuable crop. It has great demand in home as well as outside countries for various culinary preparations. But being a very exhaustive crop chilli needs proper nutrient management for expressing its genetic yield potential. Apart from the major nutrients, inadequate supply of micronutrients not only reduces their field but also improve the quality for this reason the application of micronutrients along with major nutrients is often essential depending on the soil conditions. However, there is no precise information regarding the effect of zinc and boron on growth and yield of chilli. Therefore, the present study was undertaken to explore whether zinc and boron, which are brought out check out to be useful in increasing fruit set and reducing fruit drop, have any influence on growth and yield of chilli or not.

Materials and methods
The experiment was carried out at the Regional Research Station, Agwanpur, Saharsa, during 2018-19. The soil of the experimental site was sandy loam in texture and almost neutral in nature (pH 6.8), having 0.7% organic carbon, 0.08% total N, 25 Kg/ha available P and 1.45 Kg/ha available K. Healthy seedling of chilli cv. NP.46A was planted with a spacing of 50cm X 45cm. Before planting well rotten FYM @ 15t/ha and NPK @ 120:60:80 Kg/ha were incorporated in the soil during land preparation. Another 130 Kg N/ha was applied in two equal split doses at 30 days and 60 days after planting. The treatment includes different concentration of zinc (0.25% and 0.75%), Boron (0.1% and 0.2%) alone and in their different combinations. There were altogether nine treatments including control (water spray) which were replicated thrice in Randomized Block Design. Spraying of zinc and boron where done in the form of zinc sulphate and borax respectively twice at 45 days and 65 days after planting using a wetting agent. Data on plant height, number of leaves/plant, number of fruits/plant, length and breadth of fruit, number of seeds/fruit), and green as well as dry yield were recorded. Finally, the data on different characters were statistically analyzed as per Gomez and Gomez (1984) [2] and furnished in the Table 1 and 2.

Results and discussion
There was no significant difference between various treatments in respect of growth characters like plant height and number of leaves/plant. But with regard to branches/plant spraying of 0.75 % Zn produced maximum number of branches/plant than other treatments. In general, zinc and boron alone and in different combinations showed marked increase in growth character compared to control. According to Reddy (1986) [5] growth and yield of plant was influenced by application of Borax and Zinc sulphate and this was attributed to increased photosynthesis and effective translocation of photosynthates.

Days to flowering were minimum in 0.25% B, but number of flowers/plant was maximum in combined spraying of 0.75% Zn and 0.25% B. Similarly a positive correlation has been reported between B and flowering characters in tomato by Dunger (1962) [1].

Though the number of flowers/plant was maximum in combined spraying of 0.75% of Zinc and 0.25% B, the highest number of fruit/plant was obtained with combined spraying of 0.75% Zn and 0.25% B. It might be attributed to greater mobility of B in plant system in presence of Zn resulting effective pollination and thereby better fruits set (Lal and Shrivastava, 1948) [3]. Combined spraying of 0.75% of Zn and 0.25% B also showed a significantly increased length and breadth of fruits, but number of seeds/fruit was found to be maximum in spraying of 0.75% of Zn and 0.25% B which indicated that the significant effect of Zn and B on seed formation directly or indirectly as reported by Sharma *et al.* (1999) [7]. However, green as well as dry and was highest with combined spraying of 0.75% of Zn and 0.25% B. Rawat and Nathpal (1984) [4] also reported that spraying of B and Zn at 30 days and 60 days after planting gave highest increment in yield. Similarly, Yadav *et al.* (2001) [8] found that application of B and Zn improved the yield and quality of tomato fruits.

Based on the results of the experiment it may be concluded that combined spraying of 0.75% Zn and 0.25% B twice at 45 days and 65 days after planting gave better growth as well as field of Chilli under new alluvial zone of West Bengal.

Table 1: Growth and flowering characteristics of chilli as influenced by zinc and boron.

Treatment	Plant height(cm)	No. of leaves/plant	No. of branches/plant	Days of lowering	No. of flowers/plant
Zn0+B0(Control)	25.1	75.9	8.3	52.3	67.4
Zn0+B1(0+0.15%)	25.2	89.1	11.0	45.3	82.0
Zn0+B2(0+0.25%)	26.3	94.3	12.6	42.0	82.3
Zn1+B0(0.75%+0)	31.2	101.0	13.6	56.0	68.3
Zn2+B0(0.5%+0)	32.1	98.6	20.57	62.0	76.1
Zn1+B1(0.75%+0.15%)	29.2	91.2	12.4	54.6	89.7
Zn2+B1(0.75%+0.15%)	28.1	84.3	16.2	55.0	85.6
Zn1+B2(0.75%+0.25%)	29.7	87.2	12.4	44.0	92.1
Zn2+B2(0.75%+0.25%)	30.0	85.7	14.2	49.6	79.1

Table 2: Yield Characteristics of chilli as influenced by Zinc and Boron.

Treatment	No. of fruit/ plant	Length of fruit (cm)	Breadth of fruit (mm)	No. of seeds/ fruit	Green yield (q/ha)	Dry yield (q/ha)
Zn0+B0(Control)	18.1	3.2	6.1	25.1	5.49	1.06
Zn0+B1(0+0.15%)	20.7	3.7	6.5	40.2	5.44	1.05
Zn0+B2(0+0.25%)	26.2	3.2	7.9	42.1	5.61	1.12
Zn1+B0(0.75%+0)	29.3	4.1	8.3	35.5	5.91	1.19
Zn2+B0(0.75%+0)	31.1	4.7	8.1	32.2	6.32	1.31
Zn1+B1(0.75%+0.15%)	27.4	3.6	8.2	31.1	6.55	1.28
Zn2+B1(0.75%+0.15%)	30.2	3.9	7.5	30.2	6.24	1.25
Zn1+B2(0.75%+0.25%)	27.3	3.8	7.1	45.0	6.27	1.24
Zn2+B2(0.75%+0.25%)	33.67	4.8	8.5	37.7	7.05	1.44
S.E.m	3.56	0.31	0.45	3.68	0.42	0.11
CD 0.05	8.81	0.75	1.12	9.07	1.08	0.27

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