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Impact of zinc, boran and iron elements on yield and economics of ginger (*Zingiber-officinale Ros.*)

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ABSTARCT
An experiment was conducted during *Kharif* seasons of 2001-02 to 2003-04 at TCA, Dholi, Muzaffarpur (Bihar) to study the effect of different levels of Zinc and Boron as soil application and two to three foliar sprays of Zinc sulphate and Ferrous sulphate on growth and yield of ginger cultivar "Nadia". Soil application as well as foliar sprays of these micro-nutrients have greatly influenced the growth and yield of ginger (*Zingiber-officinale* Rose) crop. Soil application of Zinc Sulphate @ 10 Kg/ha, Spray of 0.5% Zinc sulphate or 1.0% ferrous sulphate at 45 and 55 days after sowing two sprays and 0.5% zinc sulphate or 1.0% ferrous sulphate at 45, 55 and 65 days after sowing (three sprays) gave at par and significantly higher plant growth and rhizome yield of ginger. The cost : benefit ratio of two foliar sprays of Ferrous sulphate @ 1.0% at 45 and 55 days interval and soil application of Zinc @ 10.0 kg/ha was quite higher i.e 1:4.96 and 1:4.35, respectively.

Key words : Ginger, *Ginger officinale,* Zinc as zinc sulphate, Boron as borex, Ferrous as ferrous sulphate,Cost : Benefit.

INTRODUCTION

Ginger is one of the cash crop of north Bihar. It is usually one of the important constituent of *Ayurvedic* medicines, pickles *Chatani* and dish vegetables in daily domestic purpose. Farmers grow ginger either as a pure crop or inter crop with pigeopea and chilli. Cultivation of different green manuring crops befor planting of rhizomes and use of organic manures along with inorganic fertilizers were advocated by several workers (*Pillai*,1973; *Maiti et. a.l.*, 1985, *Chaudhury et. al.,* 1985) . The calcareous soil of north Bihar are deficient in micro-nutrient especially in Zn, B and Fe and these elements usually act as limiting factor for economical and healthy production of ginger. Hence this experiment was laidout to asses the effect and dose of micro-nutrients for healthy and economic crop production in north Bihar.

MATERIALS AND METHODS

The experiment was carried out at the Department of Horticulture, T.C.A. Dholi of the Rajendra Agricultural University Bihar, Pusa, Samastipur during 2001-02 to 2003-04. The soil of experimental plot was sandy loam in texture and normal (pH-7.9) in nature, having 116 Kg/ha the available nitrogen, 5.3 kg/ha available phosphorus, 127.2 kg/ha available potassium; 0.43 eg/g available Zn, 6.13 eg/g available Fe and 0.39 eg/g available B. Disease free healthy rhizomes of cultivar Nadia with uniform size 25 to 30g. (average weight) were planted in the 3rd week of May every year under all India Co-ordinated Research Project on Spices. The plot size for each treatments was 3.0m 2.4 m and planting distance was 30 cm 20cm. Before planting, well rotten Farm Yard Manure @25 tones/ha and N,P and K @ 80,60 and 100 kg/ha, respectively were incorporated in the soil. The treatments includes Zn level @ 2.5, 5.0 and 10 kg/ha, B-level @ 0.5, 1.0,1.5 and 2.0 kg/ha, two spraying of 0.5% solution of Zinc sulphate at 45 and 55 days after sowing, three sprayings of 0.5% solution of Zinc sulphate at 45, 55 and 65 days after sowing, two spraying of 1 % solution of Ferrous sulphate at 45, and 55 days after sowing and three sprayings of 1.0% solution of ferrous sulphate at 45, 55 and 65 days after sowing. There were twelve treatments including control (without micro-nutrient) which were replicated thrice in randomized block design. The crops were harvested in second week of February (250 days after sowing) and yield data were recorded. The plant height and number of tillers per plant were recorded before harvesting.

RESULTS AND DISCUSSION

Soil application of Zn and B as well as foliar application of Zn and Fe showed marked increase in height of the plants and rhizomes yield as compared to control (Table 1). The maximum height (51.75 cm) of the plant was recorded by two foliar sprays of 1.0% solution of Ferrous sulphate at 45 and 55 days followed by three foliar spray of Ferrous sulphate (50.07 cm) at 45,55 and 65 days after sowing. There were non significant effect on the number of tillers per plant. The significantly higher fresh rhizomes yield of ginger was recorded (20.26 t/ha) with two foliar spray of 1.0% Ferrous sulphate closely followed by soil application of Zinc @ 10.0 kg/ha (19.70 t/ha), three spraying of 1.0 % Ferrous sulphate and two to three spraying of 0.5% Zinc sulphate after 45 days sowing at 10 days interval. All the treatments of micro-nutrients showed extra yield starting from 29.40 to 125.10% over control (only NPK application) but two foliar spray of ferrous sulphate (1.0 %) or soil application of Zn @ 10 kg/ha were quite effective and high remunerative.

Since the soil of experimental plot was deficient in these micro-nutrients, hence response of crop to their application is obvious. Iron and Zinc is very effective is regulating plant growth because it forms a part of enzyme system (e.g carbonic anhydrate) which regulates plant growth. Besides, Zn stimulates photosynthetic activity (Samola Das, 1965) and its presence is important for protein synthesis (Possingham, 1956). Roy (1992) also reported

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