*Asian J. of Bio Sci. (2006) Vol. **1** No. 2 : 89-91*

The effect of micronutrients on yield attributes, yield and nutrient uptake of hybrid rice (*Oryza sativa* L.)

Indira Chaturvedi
Department of Zoology, C.M.D. Post Graduate, College, Bilaspur - 495 001(Chhattisgarh), India

(Accepted : April, 2006)

A field experiment was conducted during the rainy seasons of 2003 and 2004 at Agricultural Farm Bilaspur, Chhattisgarh to observe the effect of micronutrients (Zn, B and Mn) alone or in combination on the yield, some yield attributes and nutrient uptake of hybrid rice (*Oryza sativa* L.). The experiment was laid-out in randomized complete block design (RCBD) with eight fertilizer treatments. The highest value of yield, different yield attributes and uptake of nutrients were recorded in the plots receiving boron in combination with Mn and Zn. Application of Mn+B+Zn significantly increased no of grains/ear and 1000 grain weight by 29.39 and 16.60% respectively over control. Application of Mn+B+Zn to rice crop improved its seed and straw yield (47.59 and 47.43%) and N, P and K uptake (83.33, 92.68 and 95.27%) thus emphasizing the need for micronutrient application to rice and other crops.

Key words : Boron toxicity, Micronutrient, Rice, Zinc

INTRODUCTION

RICE (*Oryza sativa* L.) is the main cereal crop in India but its productivity is very low compared with that in other advanced countries like China, USA and Japan. The crop is generally fertilized by farmers with nitrogen, phosphorus and potassium only, though micronutrients are also equally important. Micronutrients are elements which are essential for plant growth, but are required in much smaller amounts than those of the primary nutrients, nitrogen, phosphorus and potassium. Micronutrients are as important as the primary and secondary nutrients in plant nutrition. Rice like other commonly grown field crops requires 16 essential elements to complete the metabolic processes necessary for growth and reproduction.

Boron deficiency in crops is more widespread than the deficiency of any other micronutrient in the world (Gupta, 1993). Adequate B nutrition is critical not only for high yields but also for high quality crops (Brown and Shelp, 1997). B deficiency causes many anatomical, physiological and biochemical changes in plants (Blevins and Lukaszewski, 1998). The availability of B to plants decreases with increasing soil pH, particularly in calcareous soils and in soils with high clay content. Availability also decreases sharply under drought conditions probably because of both a decrease in B mobility by mass flow to the roots and the polymerization of boric acid (Marchner, 1995). Zinc deficiencies are widely spread throughout the world, especially in the rice lands of Asia and deficiencies occur in neutral and calcareous soils (Tisdale *et al*., 1997). Zinc uptake by plants decreases with increased soil pH. Uptake of zinc also is adversely affected by high levels of available phosphorus and iron in soils. Manganese deficiencies have been reported in different crops grown on organic soils.

Need for micronutrient fertilization in soil is increasing, yet the proportion of different fertilizer used in the country is not quite balanced. Higher crop yields naturally have higher requirement of nutrients due to more pressure on the land for available forms of nutrients. Thus, in this study, an attempt was made to find out the effect of several microelements (Zn, B and Mn) alone or in combination on yield attributes, yield and nutrient uptake of hybrid rice for increased sustainable yield.

MATERIALS AND METHODS

The field experiment was conducted at Agricultural Farm Bilaspur, Chhattisgarh during 2003 and 2004. Physico-chemical properties of the soil were measured by the standard methods of soil chemical analysis. The analysis for respective years of experimentation revealed that the soil had 0.52% organic carbon, 224.4 kg/ ha available nitrogen, 20.9 kg/ ha available phosphorus, 240.2 kg /ha available potassium with *p*H 7.98. The experiment was laid out in randomized complete block design (RCBD) with three replications. Treatment details were as follows:

T_1 NPK = Control (no micronutrient)
T_2 NPK+ Mn = Manganese sulphate @15 kg/ha
T_3 NPK+ Zn = Zinc sulphate @10 kg/ha
T_4 NPK+B = Boric acid @ 10 kg/ha
T_5 NPK+ Mn + Zn = Manganese sulphate @15 kg/ ha + Zinc sulphate @10 kg/ha
T_6 NPK+ Mn +B = Manganese sulphate @15 kg/ha + Boric acid @ 10kg/ha
T_7 NPK+ Zn +B = Zinc sulphate @10 kg/ha+ Boric acid @10 kg/ha
T_8 NPK+Mn+B+Zn = Manganese sulphate @15 kg/ha + Boric acid @ 10kg/ha + Zinc sulphate @10 kg/ha

A uniform application of 125 kg/ha N as urea, 75 kg/ha P2O5 as triple super phosphate (TSP) and 100 kg/ha K as K_2SO_4 were given to all the plots. Crop was raised following the recommended package of practices. Rice hybrid 'Proagro 6207' was transplanted at row spacing of 20 cm × 10 cm.

The uptake of nutrients (N, P, K) was calculated as nutrient uptake = concentration (%) of the given nutrient × yield on dry weight basis. The crop was harvested and data on yield attributes and yields were recorded. The data were analysed statistically on pooled basis for both years, as per procedure suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Pooled data for 2003 and 2004 show that addition of micronutrients alone or in combinations significantly increased the yield attributes viz grains/ear and 1000 seed weight compared with the control (Table 1).

Every micronutrient treatment like B, Mn, Zn and their combinations gave significantly higher per cent of filled grain as compared to control. The highest grains/ear (100.5) was recorded in T_8 treatment and statistically at par with that of treatments T_7, T_6 and T_4 where B was applied alone or in combination with Mn or Zn. So it is clear that the effect of B was more pronounced than any other micronutrients. This result indicated that the addition of B had a vital role on the grain set in rice.