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Title: STUDIES ON BORON (B) AND ZINC (Zn) AVAILABILITY UNDER RICE – WHEAT SYSTEM IN ALFISOL

Publisher: Birsa Agricultural University, Kanke, Ranchi, Jharkhand

Language: en_US

Type: Thesis

Pages: 173

Agrotags: null

Keywords: STUDIES ON BORON (B) AND ZINC (Zn) AVAILABILITY UNDER RICE – WHEAT SYSTEM IN ALFISOL

Abstract: Rice and wheat are the main crops in India providing national food security and hence, the rice-wheat system is the most prevalent cropping system. This cropping system is remunerative but at the same time it is the most nutrient exhaustive as well. Replenishment of major nutrients mostly and ignorance towards micronutrients have resulted in an imbalanced situation which is limiting the yield maximization efforts. In general, zinc (Zn) deficiency is very common in rice whereas Zn as well as B deficiencies are prevalent in wheat. It has been reported that rice crop removes larger quantities of micronutrients compared to wheat (Gupta, 1993). Red and lateritic soils of Jharkhand (specially the southern plateau) falling under the soil order "Alfisol" are deficient in micronutrients including B and Zn. Soils of about 45 per cent of the state are found to be deficient in available B (<0.5 mg kg⁻¹) while about 7 per cent area are deficient in available Zn (<0.5 mg kg⁻¹). As per the preliminary reports, the micronutrient deficiencies, in general, and B and Zn deficiencies, in particular, are limiting the productivity and production of rice and wheat in Jharkhand. Virtually no or very little work on B and Zn has, so far, been conducted in Jharkhand. Hence, it was felt essential to have sufficient research work on these two important micronutrients. In view of the above facts the present research work was carried out at Ranchi in Kharif and Rabi seasons of 2012-13 and 2013-14 with the main objective to study the crop response to Zn and B application. Results obtained from this study revealed, in general, that soil applications of B and Zn increase the boron and zinc status of soil, both in cases of rice as well as wheat. The maximum contribution of soil B and Zn built up was achieved in cases of BL3 (1 kg ha⁻¹ B in the form of borax as basal application followed by 2 foliar sprays of 0.2% borax at tillering and pre-flowering stages) and ZL3 (5 kg ha⁻¹ Zn in the form of Zinc Sulphate as basal application followed by 2 foliar sprays of 0.5% zinc sulphate at tillering and preflowering stages), respectively. The B application level BL3 could bring the soil B content little above the critical level of 0.5 mg kg⁻¹. The levels of B application under this investigation are still inadequate, as far as the built-up of soil B content is concerned. Hence, B application will probably have to be enhanced above 1.5 kg B ha⁻¹ with appropriate combination of its foliar application as well. However, this would require further research. Another level B application BL2 (1.5 kg B ha⁻¹) and Zn application ZL2 (10 kg Zn ha⁻¹) were also found to have positive impacts on rice and wheat yields which were at par with the levels BL3 and ZL 3. However, considering the amount of input (B and Zn) the levels BL3 and ZL3 could be considered superior ones. Hence, B application in soil @ 1 kg ha⁻¹ followed by 2 foliar applications at tillering and pre flowering stages and Zn application in soil @ 5 kg ha⁻¹ followed by 2 foliar applications at tillering and pre flowering stages are advocated. The treatments coupled with foliar applications of B as well as Zn were also found to enhance the B and Zn utilization efficiencies of rice and wheat crops. Boron and Zinc applications have been found to reduce the sterility percentage both in rice and wheat crop under all the levels of applications, the maximum being under BL3 and ZL3. As far as the mobility of these two micronutrients is concerned, B has been found to be less mobile in plant and hence more accumulation was found in lower parts. In case of Zn, its mobility was found more towards lower plant parts at vegetative stage whereas it was found to translocate more towards upper plant parts at reproductive stage. Benefit cost ratio (BCR) and nutrient use efficiency (NUE) were found more in case of boron than Zn application in rice whereas in wheat BCR was more in Zn application and NUE was more in B application. Multi nutrient extractant (AB-DTPA) for simultaneous extraction of B and Zn from soil was found not suitable in case of B. However, it was highly correlated in case of Zinc.

Description: STUDIES ON BORON (B) AND ZINC (Zn) AVAILABILITY UNDER RICE – WHEAT SYSTEM IN ALFISOL

Subject: Soil Science and Agriculture Chemistry

Theme: STUDIES ON BORON (B) AND ZINC (Zn) AVAILABILITY UNDER RICE – WHEAT SYSTEM IN ALFISOL

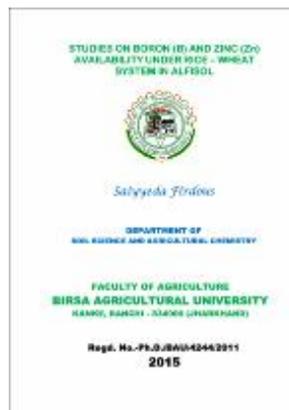
These Type: Ph.D

Issue Date: 2015

Appears in Collections: Thesis (/handle/1/93550)

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