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Interaction effect of lime and boron on cabbage-okra cropping system in boron difficient acidic laterite soils of Bhubaneswar

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ABSTRACT

A field experiment was conducted in the lateritic soils of Bhubaneswar to study the effect of lime and boron on yield and nutrient content of cabbage. The results revealed that liming and boron (B) application has significant effect on cabbage yield, which varied between 39.9 to 62. t ha^{-1}. Highest significant yield of 62.11 t ha^{-1} was obtained with 0.2 lime requirement (LR) + B @ 2 kg ha^{-1}). The yield of cabbage increased with levels of lime up to 0.2 LR but thereafter it declined at 0.3 LR. With application of lime the cabbage yield was increased by 21 to 31% over control (L_0B_0) at 0.1 LR to 0.2LR. With application of B there was increase in yield by 16 and 22 % over control at boron 1 kg (B_1) and boron 2 (B_2) kg levels, respectively although the yield at B_1 and B_2 were non- significant. With application of lime the pH of the post-harvest soil increased. On the other hand with application of B the pH was decreased as compared to no B treatment. The available B content in post harvest soil was decreased in B_0 treatments. The quality parameters like protein, ascorbic acid and carbohydrate content of cabbage were increased with increasing levels of B and lime. After harvest of the cabbage, okra was grown in residual lime and boron. Recommended dose of chemical fertilizer was applied to all treatments. There was difference in the pod yield due to residual effect of lime and boron. The pod yield was increased by 5-10% under residual lime and 2 -6% under residual B treatment over L_0B_0. cabbage responded to lime and B application. There was synergistic effect of lime x boron on cabbage, which was found significant and promising. Liming @ 0.2 LR and B @ 2 kg/ha increased cabbage yield by 31% over control. The yield of succeeding okra crop increased by 5-10% under residual lime and 2 -6% under residual B treatment over L_0B_0.

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Acid soils in the state of Orissa constitute more than 75 % of the total cultivated area. Acid soils support major crops of the state. But the yield of pulses, oil seeds and vegetables are far below than the national average. Soil acidity along with deficiency of sulphur, calcium and boron are found limiting to the crop yield in these regions. Inadequate and imbalanced nutrition influences the yield and quality of crops. Boron deficiency is found in nearly 33% of areas of the country. Boron (B) is important in agriculture because of its deficiency and toxicity in soils can both adversely affect plant growth. Deficiency of B is more wide spread than the deficiency of any other micronutrient (Reisenauer *et al.*, 1973). Boron deficient soils include those which are inherently low in B, calcareous and coarse textured soils (Lucas and Knezek 1972) and those high in clay (Mengel and Kirkby, 1982).

Jena (2006) reported that about 44% soils of Orissa were deficient in B and also surveyed the intensive groundnut, rice and sugarcane growing areas of the state which indicated that about 40 – 100% sugarcane, 60 – 80% groundnut and 42 – 72% rice plant samples were deficient in B. Mandal *et al*. (2006) conducted experiments on farmer's fields on three places of B deficient soils (alluvial soils of West Bengal and Orissa and red and laterite soils of Jharkhand), which indicated that application of boronated NPK (0.3% B) increased yield of the crops to the tune of 4.3 to 66.7%, 6.0 to 22.9%, 1.9%, 9.4%, 2.4 to 27.2%, 4.8%, 5.4%, 15.1% and 5.0 to 16.2% for mustards, wheat, lentil, coriander, potato, tomato, chilli, groundnut and cauliflower, respectively, over NPK alone. The addition of organic manure may influence the availability of B by adsorbing more B than mineral constituents (Yermiyaho *et al.*, 1988; Gu and Lowe, 1990) and coating the B fixing mineral surfaces. Also it is well established that much of the B in soil is associated with organic matter in tightly bound compounds, which is released in available form by microbial action (Berger and Pratt, 1963).

Cabbage is an important vegetable crop of Orissa, which needs B as a primary micronutrient. Soil analysis data showed that boron is a limiting micronutrient and deficiency of B in crops leads to reduction in yield and quality. Various research data on response of crops to B application is available. However, the information on B management in acid soil in a cropping sequence is inadequate. Therefore, the present investigation was undertaken to study the interaction effect of lime and boron on cabbage – okra cropping system in boron deficient