NUTRIENT DEFICIENCIES IN AGRICULTURAL SOILS OF THE WET AND INTERMEDIATE ZONES OF SRI LANKA

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The inherent low fertility status of most agricultural soils in Sri Lanka makes nutrient deficiencies a serious problem for profitable crop production. At present, few farmers are using soil test-based fertilizer recommendation, considering only N, P, K and Mg deficiencies. Soils are usually not tested for deficiencies of S and micronutrients and these nutrients are therefore not supplied by majority of the farmers. Deficiencies of S and micronutrients however have been often reported for various crops in different parts of the country.

This study was conducted to examine the available nutrient status and identify the nutrient deficiencies in major agricultural soils of Sri Lanka. Soil analyses along with sorption studies and a greenhouse experiment using a modified missing element technique were conducted to identify nutrient deficiencies in 20 soils located in the Wet and Intermediate zones of Sri Lanka. Soils used included Alfisols, Ultisols, Inceptisols and Entisols, which were under major agricultural crops. Soil samples were analyzed for important physical and chemical properties and available nutrients, i.e, N, P, K, Ca, Mg, S, Fe, Mn, Cu, Zn and B using standard techniques. Sorption studies were carried out to determine the capacity to retain nutrients by soils. A greenhouse experiment was conducted using a modified missing element technique, in which, the nutrients were supplied based on the nutrient content and adsorption characteristics of soils. The fourteen treatments included an optimum treatment (where all nutrients and $CaCO_3$ were provided), twelve treatments with one for each missing element (N, P, K, S, Ca, Mg, Fe, Mn, Cu, Zn, B and Mo) and one treatment without $CaCO_3$. Sorghum was used as the indicator plant. Treatments were arranged in a randomized block design with four replicates. The plants were harvested and dry weights were taken after 4 weeks.

According to soil analysis, all soils were acidic in reaction with pH values ranging from 4.7 to 6.8 with low cation exchange capacities and low organic matter contents. Soil analysis for nutrients indicates that experimental soils are very poor in fertility. All soils were deficient in N and B. Most of the soils were deficient in P, K and S as well. Only one soil showed sufficient level of K while only 3 and 4 soils showed sufficient levels of P and S, respectively. Few soils were deficient in Ca and Mg, while in some, micronutrients were at deficient levels. Results of the greenhouse study clearly indicated deficiency of N, P and in some soils S and micronutrients. The dry weights of the final harvest were significantly ($p<0.05$) lower than in the optimum treatment in treatments without N and P in most soils. Boron deficiency was indicated by soil results, but no symptoms were seen in plants. Deficiencies of Fe and Zn were observed in a few soils. The results indicate the importance of diagnosing nutrient deficiencies and balanced fertilizer application including S and micronutrients for profitable crop production.