MICRONUTRIENT STUDIES ON SOME SOILS IN THE MONTANE GRASSLAND AREAS OF SRI LANKA

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by

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SUMMARY

A review of the literature revealed that, unlike work on macronutrients, micronutrient studies have not received sufficient emphasis in Sri Lanka; the information available is sporadic and unco-ordinated. Suggestions have therefore been made about micronutrient problems which need investigation and study.

Montane soils in Bopatalawa, Ambawela and Horton Plains were selected for the present study because of the possibility of micronutrient problems associated with their high organic matter content and in view of their economic feasibility for agricultural production such as growing potato and improved pasture.

At each location, soils were sampled from (a) the forest on the crest of the hill (b) the slope in the typical patana grassland, and (c) the water-logged deniya at the bottom of the hill.

Some of the physicochemical characteristics, viz: texture, pH, colour, cation exchange capacity and organic carbon content, were estimated by standard techniques, and organic matter was fractionated by the method of Kononova (1966). Most of the soils are sandy loams with acidic pH. Organic carbon values range from 1.21 to 13.88 percent, and CEC varies from 10.46 to 56.78 me percent.

Total and extractable fractions of manganese, molybdenum, copper, zinc and iron were estimated. Methods of extraction have been reviewed for each of the micronutrients studied. The procedures adopted were suitably modified for use with soils high in organic matter.

Total manganese is very low and only a small fraction of it is in an available form. Of the various factors likely to be responsible for the poor availability, the effect of organic matter was investigated by retention studies according to the method of Misra and Mishra (1969). A major part of the added manganese is retained, and a large portion of the retained manganese is in an unavailable form. Correlation studies suggested that (a) some component, not uniformly distributed in the organic matter, is probably involved in the retention and fixation of added manganese, (b) humic acid, rather than fulvic acid, is responsible for the fixation of retained manganese, and (c) if much of the total manganese is in organic form, fixation of added manganese varies inversely with total soil manganese.

Total molybdenum is normal and, with the possible exception of the subsoil of the deniya profile at Horton Plains, available molybdenum is adequate.

Total zinc values are slightly lower than those reported elsewhere, but are above the critical values considered adequate for crop growth. Nearly 85 percent

of the samples studied are deficient in available zinc extracted by N NH_4OAc (pH 7). However, reports indicate that N NH_4OAc (pH 7) is not a good extractant for 'available zinc' and that correlations with crop growth are poor. Dithizone extractable zinc is considered to be a good indicator of plant available amounts, and this fraction is present in quantities much above the critical limits set by various workers.

The soils are well supplied with total copper and iron. Although the amount of copper extracted by N NH_4OAc (pH 7) is low, that extracted by EDTA is normal. Extractable iron is also normal.

Statistical studies have been made (i) to estimate the nature and magnitude of the influence of soil physicochemical characteristics on the amount and availability of the various forms of micronutrients, and (ii) to study the interrelationships between them. These studies indicate that (a) correlations with single soil characteristics are evident in certain cases. However, multiple correlations taking into consideration several related factors, would be more appropriate, and (b) available portions expressed as percentages of total amounts are more useful in indicating relationships and trends.

There is no consistency in the pattern of depthwise distribution of micronutrients. However, on an average, total and extractable manganese, and

extractable molybdenum, zinc and copper accumulate on the surface layers, while total molybdenum, zinc and copper, and total and extractable iron accumulate in the subsoils.

Total and extractable amounts of micronutrients are generally low in Horton Plains soils, probably because the parent material of these soils is poor in micronutrients and the organic matter content is high. Deniya soils contain lower amounts of total micronutrients than the soils of forest and patana profiles probably because of their higher organic matter contents. However, both in Horton Plains and in deniya soils, larger percentages of total micronutrients are extractable, probably because of their high moisture content, resulting in a more ready breakdown of micronutrient-containing minerals.