THE PRODUCTION OF A LIME-INDUCED MANGANESE DEFICIENCY ON AN ERODED KENTUCKY SOIL

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The practice of liming strongly acid soil to a neutral or alkaline reaction has caused some soils to become manganese deficient for plant growth. Leeper (2) concluded that any acid soil having less than 25 p.p.m. of easily reducible manganese dioxide becomes deficient in active manganese for plant growth if it is heavily limed. Similar results were obtained in work reported from the Michigan Experiment Station (4).

Steenbjerg (7) reported that it is more difficult to develop manganese deficiency in a clay soil than in one of a sandy character. He explained this by suggesting that the clay colloid held the manganese. It is necessary to define some of the terms given above in order that the reader may clearly understand them. Leeper (2) believes that the manganese of the soil exists in an oxidation-reduction equilibrium. This equilibrium exists between the exchangeable manganese (manganous) and a continuous series of manganese of a higher state of oxidation (manganic), including a range from the most active to that which is relatively inert. For the sake of convenience only, he has called this series of manganese, manganese dioxide, realizing that they include compounds in which the manganese exists in varying degrees of oxidation above the manganous form. The active portion of this group, easily reducible manganese dioxide, is extracted by a solution of neutral normal ammonium acetate containing 0.2% hydroquinone after the water-soluble and exchangeable manganese have been removed from the soil. Active manganese is the total amount of manganese found in the leachates from the successive extractions of the soil with distilled water, a solution of neutral normal ammonium acetate, and a solution of neutral normal ammonium acetate containing 0.2% hydroquinone (5). In general, the water-soluble manganese in most soils was found to be less than 0.2 p.p.m. and for that reason was not determined in this study.

In general, the soils of Kentucky are abundantly supplied with manganese (3). The distribution of the manganese in the soil profile is similar to that reported in the work of Alexander, Byers and Edgington (1). The results of their work showed a high content of manganese in the soil and the colloidal fraction of the A horizon. There was an indication that the surface was enriched by manganese moving upward in the soil profile, as there was a depletion of manganese in the B horizon. The distribution of exchangeable manganese and of easily reducible manganese dioxide in the horizons of some typical

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3Figures in parenthesis refer to "Literature Cited", p. 1083.