SOIL LIMING INVESTIGATIONS: V. THE RELATION OF BORON DEFICIENCY TO OVER-LIMING INJURY

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DURING the course of liming investigations at the Alabama Agricultural Experiment Station, it has been found that injurious effects from excessive liming occurred with some crops on certain soils. In some instances only slight decreases in yields resulted while in others a virtual crop failure was obtained. Similar results have been reported by other investigators, but no satisfactory explanation has been given for the phenomenon. Reviews of the literature on over-liming have been given by Midgley (7) and Pierre (11).

Since the problem of over-liming injury was of both practical and theoretical importance, a study was made in which several soil amendments were used in an effort to overcome the detrimental effect of over-liming. It is the purpose of this paper to report typical over-liming results on a light-textured soil, the effect of certain soil amendments, and especially the results of additions of small amounts of boron in overcoming and preventing over-liming injury.

PLAN OF INVESTIGATION

A Norfolk loamy sand was used for this study since it had been observed that plant growth was most seriously depressed in light-textured soils by excessive liming. The surface soil to plow depth was brought to the greenhouse, passed through a quarter-mesh screen, thoroughly mixed, and 8 kilograms of air-dry soil were placed in aged 2-gallon earthenware pots. The amounts of lime required to give various degrees of saturation were determined by the CaCO₃ equilibration method (8). Certain soil amendments were added to the cultures which were planted to different crops. The details and results of these studies are given below.

RESULTS

STUDIES WITH PHOSPHATE

Duplicate pots of soils unlimed and limed to 50, 100, and 150% saturation were set up with both C.P. CaCO₃ and a mixture of equivalent amounts of C.P. CaCO₃ and MgCO₃. The phosphate treatments were 0, 30, 60, and 120 pounds P₂O₅ per acre obtained from C.P. NH₄H₂PO₄. Moderate amounts of N and K were added uniformly to all cultures from C.P. salts. Vetch was grown as the first crop and the dry weights are shown in Fig. 1. It is evident from these results, which are typical of numerous studies made during the course of this investigation, that liming injury was obtained and that the added P did not overcome the injurious effect of lime. Both sources of lime gave similar results.

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