NITRIFICATION IN THE GRUNDY SILT LOAM AS INFLUENCED BY LIMING

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NUMEROUS experiments have shown that liming acid soils influences their physical, chemical, and bacteriological properties. In studying the effects of liming on the Grundy silt loam in southern Iowa attention has been given to certain chemical and bacteriological effects. The data obtained in the chemical studies have been reported previously (6, 7). This paper presents the results of one phase of the bacteriological studies made on this soil, namely, the influence of liming on nitrification.

Inasmuch as the nitrifying power of soils has been shown to be closely related to the pH or the buffer capacity, and that it is also rather closely related to or correlated with the crop-producing power, nitrification studies have been made as indicating the influence of liming, not only on a specific physiological group of soil microorganisms, but as suggesting the influence of lime on microbiological activities of soils in general.

EXPERIMENTAL

Grundy silt loam (3) is the most extensively developed upland soil in southern Iowa. It is of loessial origin, dark brown to black in color, and has a rather compact or impervious subsoil. When properly managed this soil is very productive and it may be classed as one of the more fertile soils of Iowa. On most farms, however, the yields of crops are not as large as they should be due mainly to the fact that the soil is strongly acid and in need of lime. This conclusion is supported by the results of previous experiments (3, 4, 5).

Limestone was applied in different amounts and degrees of fineness to one-tenth acre plats of Grundy silt loam in June 1929. Quarry-run limestone was applied at rates of 1, 2, 3, 4, 5, and 6 tons per acre, and limestones of different degrees of fineness employed, namely, 20-mesh, 40-mesh, and 100-mesh, were applied at the rate of 3 tons per acre. A plat treated with hydrated lime in an amount equivalent in CaO content to 3 tons of the limestone was also included in the experiment for comparative purposes. Other plats were left untreated to serve as checks.

The soil of these variously limed plats was sampled from time to time during a period of 5 years, and the nitrifying power was determined. For the determination 30 mgm of N as ammonium sulfate were added to 100 grams (oven-dry basis) of fresh moist soil. The soils were then incubated in covered tumblers at near optimum moisture content and at room temperature for 4 weeks, after which the nitrate content was determined by the phenoldisulfonic acid method.

The hydrogen-ion concentration of the soils was determined potentiometrically by means of the quinhydrone electrode. The results of these determinations have been published elsewhere (6), but some of the data will be included here, inasmuch as the nitrifying power of soils has been shown to be closely related to the pH or the buffer capacity, and that it is also rather closely related to or correlated with the crop-producing power, nitrification studies have been made as indicating the influence of liming, not only on a specific physiological group of soil microorganisms, but as suggesting the influence of lime on microbiological activities of soils in general.

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3 Figures in parenthesis refer to "Literature Cited," p. 363.