The Effect of Varying Amounts of Ground Limestone on the pH and Base Exchange Properties of Sassafras Fine Sandy Loam

W. W. Moschler, S. S. Obenshain, R. P. Cocke, and H. M. Camper

An experiment was begun in 1924 at the Williamsburg Substation of the Virginia Agricultural Experiment Station to determine the most practical rate of liming for the more important field crops grown in Eastern Virginia. Records of crop yields were maintained and reported by Cocke and Camper (3). In 1947, soil samples from these rate of liming plots were taken and analyzed for the purpose of studying soil changes associated with different levels of liming. This paper reports the results of the soil analyses made after 23 years of operation of the rate of liming experiment.

Experimental Methods and Procedures

At the beginning of the experiment, a uniform area was selected and divided lengthwise into six subdivisions. Each of these subdivisions was limed at a different rate, beginning at zero pounds per acre and increasing in increments of 600 pounds per acre until the highest rate of 3,000 pounds per acre was reached. The six rate of liming plots were then divided crosswise into six subdivisions for the purpose of crop rotation. All the more important field crops of the section have been rotated on these plots, the rotation since 1941 having been a 6-year one consisting of corn, crimson clover, soybeans, oats, sweet clover, barley, and red clover. Fertilization has been moderate, consisting of 2,400 pounds per acre of 0-14-7 per 6-year rotation. This was divided into four applications of 600 pounds each applied to corn, barley, oats, and soybeans. The lime applications were repeated each 4 years.

Method of Sampling

Soil samples were taken at two depths, 0 to 8 inches, and 10 to 18 inches. A sampling tube, one inch in diameter, was inserted to a depth of 18 inches and the soil core removed. The 8- to 10-inch layer was discarded to avoid contamination of either of the two layers saved for analysis. Samplings were made at 20 to 30 locations in each subplot and the samples were thoroughly mixed to form a composite sample for each subplot.

Method of Analysis

pH readings were taken on the Beckman meter using a glass electrode, a 1:1 soil to water ratio, and a standing time of one half hour. Organic matter, exchangeable calcium, exchangeable magnesium, and exchangeable hydrogen by the triethanolamine method were determined by the methods described by Peech et al., in Circular 757, U. S. D. A. (4). True phosphorus was determined by leaching with 0.002 normal H₂SO₄ and developing the color with stannous chloride (5). Exchangeable potassium was determined on another aliquot of the same ammonium acetate leachate used for determining calcium and magnesium. A Perkin-Elmer flame photometer was employed to determine concentration.

Presentation and Discussion of pH Values

The average pH of the six subplots in each rate of liming is presented in Table 1. Among the six subplots within each lime level there is, of course,