Introduction

The soils of Ohio may be roughly divided into two main groups, based on the character of the parent materials from which these soils have been derived. The soils of approximately all of the western half of the state have been derived from limestone materials, of either glacial or residual origin, while the soils of the eastern half of the state have been derived from glacial or residual sandstone and shale materials. In other words all but the southeastern one-third of the State has been glaciated. (See Figure 1).

The parent materials of the glacial limestone group of soils may contain as much as 40 percent of calcium carbonate, while the parent materials of the sandstone and shale group of soils seldom contain more than 10 percent of calcium carbonate, the most part of which carbonates are native, with the remainder, accumulated. Thus it is possible to recognize a high-lime and a low-lime group of soils in Ohio.

During the past two years, several of the characteristic soil profiles within these two groups of soils were carefully sampled, and a study begun concerned with the base-exchange properties of these profiles in relation to their contents of 0.002 mm. clay, of organic matter, of reaction (pH), and to their contents of calcium carbonate.

The methods now in use for the determination of certain characteristics of non-calcareous soils have been entirely satisfactory for soils containing calcium carbonate in appreciable amounts. The workers of the Arizona Experiment Station (1, 2, 5) have suggested methods for the determination of the exchange of calcareous and alkaline soils however, these methods are somewhat involved chemically and do not appear to be entirely suitable for those soils containing large amounts of calcium carbonate.

In order to complete the studies of the character of the soils of Ohio, it was therefore necessary to devise other procedures for determining the various characteristics of parent materials containing calcium carbonate. The procedures developed and the results obtained are reported here.

Calcium Carbonate Distribution In Calcareous Parent Materials

Mechanical analyses of selected parent material horizons were made, using recently boiled distilled water to minimize carbonate solubility. No chemical deflocculating agent was used, and dispersion was attained by the use of an electric drink-mixer. After dispersion, sands were separated from the silt and clay by a Tyler 300 mesh screen. The sands, after oven drying for 12 hours were subdivided into the fine gravel, coarse, medium, fine, and very fine sands, with a nest of Bureau of Soils type sieves. For the experiments reported here, it was found necessary to pulverize the soil to pass a 2 mm. sieve, in order to remove all materials coarser than the fine gravel. A rubber tipped pestle was used to prevent the shattering of large pieces of limestone rock, that are naturally present in most calcareous parent materials.

The calcium carbonate content of each separate portion obtained was determined by a modification of the apparatus and procedure suggested by Schollenberger (8). To facilitate decomposition, the fine gravel, medium, and fine sands were powdered in an agate mortar. The data obtained representing the calcium carbonate distribution is presented in Table 1, and graphically in Figure 2.

The sands of the limestone group of parent materials vary in their calcium carbonate content from 23 to 75 percent, with the calcium carbonate gradually decreasing as the particle size class decreases. The very fine sands are the exception. The silt fractions of the Eoss-moyne and Russell parent materials contain approximately double the amounts of calcium carbonate found in the corresponding clay fractions, while the silt of the Marysville parent materials contain nearly half the amount of calcium carbonate found in the corresponding clay fractions. The data presented in Table 1 are based on the average contents of 0.002 mm. clay, of organic matter, of reaction (pH), and to their contents of calcium carbonate.