

EVALUATION OF PARTICLE SIZE DISTRIBUTION AND USE OF HYDROCHLORIC ACID AS A PRETREATMENT IN CALCAREOUS SOILS FOR INVESTIGATING PEDOGENIC PROCESSES

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ABSTRACT

Soil texture is an important aspect of a soil profile and particle-size distribution also has a significant role in most of the soil properties. Soil texture of three profiles (Caernarfon, Lleiniog, and Penmon-buried profile) was estimated by hydrometer method. The same procedure was repeated with samples treated with 1M HCl to remove their carbonate contents. After having the readings for 50-20 μ m, 20-6.3 μ m, 6.3-2 μ m, and <2 μ m fractions by hydrometer, the materials were flushed through a series of nylon mesh sieves to get 2000-630 μ m, 630-200 μ m, and 200-63 μ m fractions. Cumulative curves between the cumulative weight percentages and the particle size (μ m) were drawn on the log scale. It was concluded that the increase in clay contents down the two profiles (Caernarfon and Lleiniog) is the result of leaching process. While the increase in clay with depth, at Penmon buried profile, was attributed to the variation in the original parent material because the pedogenic processes, due to its deep burial under a thick sand layer, were not operating here. However, the decrease in clay contents as a result of acid treatment which dissolved calcite grains in this size provided a non-visual proof of the size of calcite particles.

INTRODUCTION

The relative proportions of different size particles is important both for the purpose of characterizing the soil and also because it can give an indication of its physical properties (Arshad et al., 1994), and exerts a strong influence over many of the other soil properties, such as porosity, permeability, shear strength, structure and nutrient fixation (Bajwa 1981; Shahid et al. 1991). Also it is

can be flushed out through a set of sieves to separate the fractions of >63 μ m into different sub divisions. Any size below this and the sieves become expensive and prone to distortion.

It is important to ensure that the particles are separated from one another so that single particles rather than clusters are measured in sieving and settling. In the case of incomplete dispersion, an aggregation of clay particles having the same size as that of sand particle would be reported as sand in the results. The treatments to achieve this purpose include hydrogen peroxide, when it is necessary to remove organic matter, HCl to remove carbonates, washing to remove soluble material and vigorous mechanical action upon the soil in water to which a dispersion agent has been added. In many soils this last step is sufficient without the others (Marshal and Holmes, 1988). Sonic or ultrasonic vibration of soil in water (Edwards and Bremner, 1967) has been found to be effective even without chemical treatments, and does less damage than other mechanical treatments to minerals that fragment easily, although for most soils samples, Calgon may be sufficient dispersant on its own (Yaalon, 1957). This paper, however, reports the use of HCl as a pretreatment on calcareous soil samples and consequent change in their textural class.

MATERIALS AND METHODS

The hydrometer method of Bouyocos (1951) was used for soil samples from three profiles (Caernarfon Brick Works, Penmon-buried profile, and Lleiniog profile). The three profiles have been