MICROMORPHOLOGY OF A MARSHALL SILTY CLAY LOAM, A WEBSTER CLAY, AND A NACOGDOCHES SANDY LOAM PROFILE

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ANY field of scientific endeavor requires a schematic and accurate arrangement of the items under observation in some specific order. A system of classification is necessary, both for the scientist and the layman, whether the field be bacteriology, botany, mineralogy, soils, or any other branch of the natural sciences. Some system of classification precedes any great progress in either the scientific or applied phases of a given science.

The botanist had a system of classification for plants several decades before the pedologist had one for soils. At the outset the plant taxonomist relied on macroscopic structures; however, on the advent of the microscope the botanist had a new tool and he proceeded to classify plants by the use of microscopic structures as well as macroscopic ones. Recent advancements made by the mineralogist and micro-pedologist in the development of microscopic technics indicates that the microscope can be an aid in the field of genesis, morphology and classification of soils.

DESCRIPTION OF SOIL TYPES STUDIED

For this study three soil types of pronouncedly different characteristics were selected. The types selected were the Marshall silty clay loam, the Webster clay, and the Nacogdoches sandy loam.

The Marshall silty clay loam was derived from Missouri loessial deposits along the Missouri River in western Iowa and developed under the influence of tall grass vegetation. This soil type occurs on gently to sharply rolling topography and is well drained. The surface soil is a very dark grayish-brown silty clay loam and is usually 10 to 15 inches in depth. The B horizon is 12 to 16 inches in thickness and varies from a grayish-brown silty clay in the B1 horizon to a yellowish-brown silty clay in the B2 horizon. The C horizon is a yellowish-brown to grayish-yellow silty clay and is highly calcareous. Both soil and subsoil are loose and friable. The samples of this soil profile were taken in southwestern Iowa near Clarinda.

The Webster clay was developed from highly calcareous drift material of the late Wisconsin ice sheet and under the influence of marsh grasses and sedges. It occurs on level to depressional relief and is naturally poorly drained. The surface soil is a very dark grayish-brown to black clay and is generally 18 inches in thickness. The B horizon is approximately 18 inches thick and varies from a dark drab clay in the B1 horizon to a drab or gray clay with yellow and brown in the B2 horizon. The horizon is a gray, gritty clay loam mottled with brown lime and iron stains. This horizon contains a high amount of unweathered rock fragments and unaltered primary minerals. The Webster profile samples were taken in central Iowa 10 miles north of Des Moines.

The Nacogdoches sandy loam was derived from greensand marl and developed under forest conditions. It occurs on undulating to gently rolling topography and is well drained for a soil with such a high clay content in the subsoil. The surface soil is a reddish-gray sandy loam with many small, pebbly, dark-brown iron concretions. This horizon is usually about 12 inches thick. The B horizon is a brittle and granular red clay which is not plastic unless very wet; iron concretions are present in this layer. The B horizon extends to a depth of about 38 inches in the B2 horizon. The C horizon is a light red clay which is quite friable. Glauconite crystals and sea shells are present below an average depth of 5 or 6 feet. The Nacogdoches sandy loam profile samples were taken 2 miles east of Nacogdoches, Texas.

PHYSICAL AND CHEMICAL DATA FOR SOIL TYPES STUDIED

It was thought that the microscopical observations would have more significance if they could be related to some physical and chemical properties of the various soil profiles. Mechanical analysis for each of the three soil types were obtained by the pipette method for mechanical analysis, although the international particle size designation was used. Percent organic matter content was ascertained by addition with 6% hydrogen peroxide solution. Base exchange capacity for each soil horizon was determined by leaching with normal ammonium acetate.