STRUCTURE OF HOUSTON BLACK CLAY AS REFLECTED BY MOISTURE EQUIVALENT DATA

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Numerous moisture equivalent determinations were made in obtaining characterizing data on the soils from the Blacklands Experimental Watershed at Waco, Texas. The interpretation of these data was difficult even though it was evident from observations that the moisture equivalent was closely related to the structure of the soil. Accordingly, additional centrifuge data were obtained to furnish information that might lead to a better interpretation of the moisture equivalent data. The data consist of results obtained from determinations of moisture equivalent made on samples of Houston black clay, consisting of natural clods and soil crushed to pass through 2-mm and 0.25-mm sieve openings, and these results supplemented by density determinations on the samples following centrifuging.

REVIEW OF LITERATURE

The term "structure" has been much used as a relative term to designate the general appearance of the soil, viz. crumb, granular, massive, etc. the term "structure" has also been loosely used at times almost synonymously with total porosity. It appears, however, that the distribution of effective pore size in percentage of volume of soil is the best index of soil structure. In recognition of its importance the size distribution of pore space in soil has been the subject of much recent investigation (1, 4, 5).

Jamison (1) points out that two different processes are involved causing shifts in the size distribution of pore space in the soil; one relates to the formation and destruction of natural stable aggregates, and the other to factors that effect changes in the state of packing. It is evident that the stability of the aggregate is the characteristic chiefly responsible for distinguishing differences in pore size distribution in cultivated soil of similar composition.

Thomas and Harris (6) and others have pointed out that the structure of soil may have a profound effect on the moisture equivalent. They have also shown that a maximum exists in the moisture equivalent-particle size at about 10 µ. They considered that the pore space remained full of water during the centrifuging at 1,000 gravity with particles of this size or smaller. It has been observed by the authors that water-stable aggregates of the Houston black clay broke into a very few particles when crushed. If the crushing is so done that there is the maximum number of larger particles consistent with the stability of the particles, and if these particles are appreciably larger than 10 µ, then the number of large particles and, consequently, the stability of these particles should be reflected in the macro pore space after centrifuging. The packing in the centrifuge should reduce the macro pore space to a minimum consistent with the number and size of the larger particles and the centrifugal force used.

Veihmeyer and associates (7) have determined that treating a soil by machine grinding, crushing with a roller, or grinding with a mortar and pestle, each gave higher and more variable moisture equivalents than using the method suggested here, that of crumbling and force through a 2-mm sieve with the fingers. They attributed these differences to "degree of pulverization".

1 Contribution from the U. S. Dept. of Agriculture, Soil Conservation Service Blacklands Experimental Watershed, Waco, Texas. Received for publication May 15, 1944.
2 Junior Soil Technologist and Associate Soil Technologist, respectively.
3 Figures in parenthesis refer to "Literature Cited", p. 927.