SOIL GRANULATION AND PERCOLATION RATE AS RELATED TO CROPS AND MANURING

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The resistance of a soil to erosion and to breakdown of its granulation may be considered a function of the stability of this structure.

A soil is commonly considered to be of less stable granulation and aggregation when it will break down readily under the influence of water. Such soil will flow together and puddle to become more or less impervious. The smaller granules may swell and interstices be filled by individual soil particles, thus sealing the soil to passage of both air and water. As a result, the runoff is increased, thereby increasing erosion. On the other hand, soils whose aggregates are stable enough to hold up under the action of rainfall permit its infiltration. Such soils are well aerated, have good drainage, and store water in significant amounts. Erosion is consequently reduced because of the reduction in runoff. The productivity of such soils is also higher.

There are many factors modifying the stability of granulation, the nature of the cementing materials, and the forces holding the particles together into the granular masses. It was the intent of this study to learn whether the stability of granulation was different in consequence of different crops and of the annual applications of barnyard manure.

PLAN AND PROCEDURE

The soils studied were taken from four plots of Sanborn Field at the Missouri Agricultural Experiment Station. One pair had been in wheat continuously and the other two plots in corn, all since 1888. One of each pair has had no manure treatment. The other has had 6 tons of manure applied annually. All the produce was removed from the plots. The plots are in close proximity and were handled alike so far as possible in all other respects.

Soil samples were taken as borings of the surface 7 inches, spread out indoors, and air dried. The samples were in approximately optimum moisture when taken and in a good state of granulation. The test of the stability of granulation consisted in a measure of the rate of infiltration and percolation of water through a constant volume of soil under a constant head of water.

For this test a volume of 160 cc of air-dry soil was tamped into a 2-inch brass cylinder with a tamping machine. The bottom of the cylinder was perforated and permitted collecting the percolate. Water was run into the cylinder above the soil and a constant depth maintained by means of over-flow. At regular time intervals of 3 minutes after introduction of the water, the amount of percolate was measured by taking 10 measurements, or for a total time of 30 minutes. Replicate measurements were made of the different samples and the duplications were so similar that the data are assembled as graphs in Fig. 1.

RESULTS

It is significant that the infiltration rate was much higher for the soil of both plots under the wheat crop than for the corresponding plots under corn, as shown by the percolation of the water through