THE formation of water-stable aggregates as a result of the activity of microorganisms has been reported by several workers (1, 2, 3, 4, 5, 6), but there are many things which are not known about the relationships involved and the ways in which chemical or physical environmental factors can be manipulated so as to bring about greater aggregation from a given quantity of organic matter.

Observations on some of the field plots at Clemson, S. C., indicated that the size of organic particles incorporated with soil influenced considerably the degree of aggregation produced and that organic matter applied as a mulch was more effective in improving aggregation than an equal quantity incorporated with the soil.

In the present investigation a pot experiment was conducted in which organic matter, subdivided to different degrees, was incorporated with soil and the rates of carbon dioxide evolution, nitrate content, and degree of aggregation were determined at frequent intervals.

RESULTS

The peak decomposition rates occurred during the first 6 days, but the rates of carbon dioxide evolution were not constant. On the fifteenth day the decomposition rates were again at a comparatively low level which was maintained for the remainder of the experiment. The results of the incubation period covering about 6 months are shown in Table 3. The peak decomposition coincided with the period of highest microbial activity but the aggregate size was most effective in promoting aggregation with the soil on degree of aggregation are very striking.

The results of this investigation indicated that the size of organic particles added to the soil on degree of aggregation coincided with the period of highest microbial activity but the aggregate size was most effective in promoting aggregation with the soil. The size of organic particles added to the soil was divided into two fractions for analysis: 0 to 2 inch depth and 2 to 6 inch depth. This was thought that the effect of the mulch would be mainly in the o to 2 inch depth and the differences in aggregation of the two depths might produce all of the treatments.

The moisture content of the soil was brought to 2% above the moisture equivalent immediately after the treatments were made and once each week thereafter.

METHODS

Rates of carbon dioxide evolution were determined by measuring the quantity of CO₂ liberated by 100 grams of soil in a 500-ml Erlenmeyer flask during a period of 4 to 5 hours. A representative sample of soil was placed in the flask and freed of CO₂ by aspiration. The flask was allowed to stand closed for about 4 hours and then aspirated again for 1 hour with the CO₂ evolved being absorbed in a standard solution of sodium hydroxide plus barium chloride. The excess hydroxide was later titrated with oxalic acid using phenolphthalein as the indicator.

Nitrates were determined by the phenoldisulfonic acid method and the aggregate analyses were made by the wet-sieving procedure previously described (6). In the present investigation the aggregate data are presented in three sizes, viz., degree of aggregation, aggregates larger than 2.0 mm, and particles smaller than 0.02 mm.

The degree of aggregation as used here is the percentage of particles smaller than 0.2 mm (determined by dispersion) aggregated into particles larger than 0.2 mm. The sand larger than 0.2 mm was eliminated from the calculations for the degree of aggregation. When data are presented for aggregates larger than 2.0 mm, only true aggregates are referred to as the rock particles have been eliminated. The data for particles smaller than 0.02 mm refer to both aggregates and discrete particles that may be in suspension when the sample is pipetted after the wet-sieving operation.

A large sample of Cecil sandy loam was collected and passed through a 2.0-mm sieve immediately without allowing the soil to become air dry. Aliquots of the soil were placed in half gallon glazed pots and given various organic-matter treatments. Nitrates were determined by the phenoldisulfonic acid method and the aggregate analyses were made by the wet-sieving procedure previously described (6). In the present investigation the aggregate data are presented in three sizes, viz., degree of aggregation, aggregates larger than 2.0 mm, and particles smaller than 0.02 mm.

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