THE ability of a soil to hold available plant nutrients is largely attributed to the organic and inorganic colloidal complex of the soil. This complex is the result of a long period of soil formation and it has long been recognized that man cannot greatly influence the inorganic portions with any economic soil treatments. On the other hand, it has been demonstrated many times that the organic fraction of a soil can be greatly changed by man’s soil management practices. It would be very desirable if there were a method available to indicate the amount of the organic exchange complex in the soil.

This paper presents a study of some methods of indicating soil organic matter and their relationship to the organic exchange capacity of a soil.

Organic matter is the residue from the decomposition of living and dead matter deposited on and within a soil. This decomposition product is generally colloidal in nature and is intimately combined with the mineral colloids of the soil. Such combinations reduce the sorption power of each type of colloid (7) when compared with this property of each alone. In addition, the association of the two together makes it very difficult to separate or determine either of them. The problem of separating these two colloids is again complicated by the continuous change or decomposition of the organic portion. The estimation of this organic portion (6, 9) can be grouped into two classes. One is the extraction of the organic matter by some solvent and, after precipitating, determining its exchange capacity. Another method is to destroy the organic matter then determine the decrease in the exchange capacity. All of these methods have their weaknesses and none indicate directly the organic exchange complex. The destruction of the organic matter by the hydrogen peroxide method seems to be most used and accepted, but it is a very long procedure and sometimes not reliable (2).

There have been several rapid methods proposed for the estimation of the organic matter, but none to determine the organic exchange capacity.

PROCEDURES

The variation obtained by the use of methods for the determination of the organic of a soil was believed to indicate that some methods might extract or determine organic matter from the soil in about the same proportion as it was active in the exchange complex. Representative Maryland soils (5) were selected for preliminary survey. The organic matter was determined on these soils by nine methods. The exchange capacity was estimated on samples of these soils both before and after treatment with hydrogen peroxide. As a further check of the reliability of these methods, soil was brought into the greenhouse and incubated with various treatments, organic matter, lime, and fertilizer. It was thought these treatments might affect the organic colloidal complex. Organic matter estimations by the most promising of these methods were also made on these soils after incubation. The total exchange capacity was determined both before and after oxidation with hydrogen peroxide. These data were used to ascertain if there was any significant relation between these methods of estimating organic matter and the organic exchange capacity.

The hypoiodite method used was that of Norman and Peevy (8). The ammonia extraction was a modification of the method of Cameron and Breazeale (3). The soil was shaken with a 10% ammonium solution, centrifuged, the clear extract poured off, and evaporated to dryness. The residue was taken up with a little water and dilute sulfuric acid for total carbon determinations.

The potassium permanganate method was a modification of one proposed by Treadwell and Hall (14). Three grams of soil were treated with 20 ml of N/10 potassium permanganate. The excess permanganate was titrated with ferrous ammonium sulfate.

The Walkley and Black method (15) consisted of treatment of 0.5 gram of soil with 10 ml of sodium dichromate and 20 ml of concentrated sulfuric acid. The solution was heated in a bath for 15 minutes. After the solution had cooled, it was acidified with hydrochloric acid and potassium permanganate was added. The excess permanganate was titrated with ferrous ammonium sulfate.