COMPARISON OF DRY COMBUSTION AND WALKLEY-BLACK METHODS FOR THE DETERMINATION OF ORGANIC CARBON DISTRIBUTION IN SOIL PROFILES

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The amount and distribution of organic carbon, reflected in the color and thickness of the upper horizons, are distinctive features of the profiles of Prairie soils. Moreover, these properties lend themselves to quantitative measurement and therefore can be useful in the description and classification of Prairie and associated soil groups.

The amounts of carbon in soil samples have been estimated by a number of different methods, among which that of dry combustion is accepted generally as standard (1, 6, 7). Three different methods have been compared by Alexander and Byers (1) and four have been studied by Smith and Weldon (9). The reader interested in detailed comparisons of a number of procedures is referred to the above papers.

The distribution of carbon in soil profiles has been studied in this laboratory by determinations made by the dry combustion method described by Winters and Smith (11). Efforts have been made, however, to find a more rapid procedure that would provide comparable data. Special attention has been given to the method of Walkley and Black (10), since it is rapid and has been used widely (2, 6, 9).

Comparisons of the Walkley-Black method with both dry combustion and wet combustion methods have been reported previously (2, 6, 9), but these studies have not been concerned with carbon distribution in soil profiles. Browning (6) compared data obtained by the Walkley-Black and dry combustion procedures and found that the average recovery of carbon by the former method was 85%. Considerable deviations in recovery from the average were noted with some of the soil samples, however, and it is pointed out that values obtained are approximate.

Baker (2) analyzed samples of the surface horizons of seven soils by the Walkley-Black and by A.O.A.C. wet combustion methods. Recoveries of carbon by the former method ranged from 70.0 to 83.7%, with an average value of 77.2%.

Smith and Weldon (9) studied the hydrogen peroxide, wet combustion, Schollenberger, and Walkley-Black methods. Their study included analyses of a number of samples of surface horizons, analyses of principal horizons in eight profiles and analyses of samples of the surface layer of Marshall silty clay loam from plots on which organic matter restoration experiments had been conducted. The average recovery of carbon in the various groups of samples by the Walkley-Black method, based on amounts determined by wet combustion, ranged from 72 to 76%. Variations in recovery of carbon in the hori-