

ORGANIC CARBON ESTIMATIONS IN SOILS: ANALYTICAL PROTOCOLS AND THEIR IMPLICATIONS

Joshua Abraham

Rubber Research Institute of India, Kottayam-686 009, Kerala, India

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Several protocols for the estimation of soil organic carbon (SOC) are in practice by different laboratories. Quantitative to semi quantitative methods are followed for different objectives. Dry combustion protocols are quantitative in nature and are utilized to standardise other protocols. Walkley-Black (WB) protocol for organic carbon is widely followed in many laboratories because it is rapid and affordable. However, it is semi-quantitative in nature and do not completely recover the organic carbon in soils. Also considerable sample to sample variations in the recovery of carbon are reported. Through the application of external heat in WB protocol (modified-WB) more recovery, though not complete, of SOC is reported. If WB or modified-WB protocols are followed, standardization with an accurate method is necessary and correction factors need to be generated to account for the non recovered portion of organic carbon in soil. The soils of different rubber growing regions were analysed by WB, modified-WB and dry combustion (DC) methods and the values were compared. It is found that, sample to sample, the recovery percentage of SOC widely varied when WB or modified-WB protocol was followed compared to the values generated by DC protocol. On an average 71 per cent recovery of SOC by WB method and 92 per cent recovery by modified-WB method were observed. Correction factors of 1.3850 for WB and 1.1299 for modified-WB were derived to account the non recovered portion of soil organic carbon. After applying the derived correction factor, the values obtained by WB and modified-WB methods were not significantly differing from the values generated by DC method, suggesting that the correction factors hold good when a group of samples are considered.

Keywords: Dry-combustion method, Soil organic carbon, Soil organic matter, Walkley-Black method

INTRODUCTION

Soil organic matter (SOM) is an important soil component, which can directly or indirectly affect almost all the soil properties (Weil and Magdoff, 2004). Numerous organic compounds are present in soil with widely varying chemical nature and structure. There are direct methods to

estimate SOM, in which the organic compounds present in a specific weight of soil is destructed either thermally or chemically and the weight difference is calculated. Loss on ignition or oxidation by H_2O_2 are such methods, however, these methods are subject to errors (Christensen and Malmros, 1982; Howard and Howard,