AN OVERVIEW OF PROCEDURES USED FOR TOC ASSESSMENT FROM ORGANIC INPUTS

Assoc. Prof. Dr. Roxana Maria Madjar
University of Agronomic Sciences and Veterinary Medicine, Faculty of Agriculture, 59 Blvd. Marasti, 011464, Bucharest, Romania

Lecturer Dr. Gina Vasile Scaeteanu,
University of Agronomic Sciences and Veterinary Medicine, Faculty of Agriculture, 59 Blvd. Marasti, 011464, Bucharest, Romania

Total Organic Carbon (TOC) analysis is carried out in different research areas, but for agricultural purposes is a good indicator to estimate the carbon content of soil, meanwhile for organic fertilizers and composts is a manner to evaluate the content and stability of organic matter [1]. TOC comprise carbon from all organic sources covalently bound [2].

The reported methodologies for TOC assessment follow the same steps: (**i**) **oxidation** of organic carbon to CO_2 and (**ii**) **quantification** of the resulted CO_2.

Oxidation is achieved by chemical reagents, combustion, and exposure to ionizing radiations. According to literature, the most accurate method of oxidation is dry combustion at high temperatures in a furnace, method which could be used as reference [3].

Quantification of CO_2 is performed by non-dispersive infra-red (NDIR) method which measures CO_2 directly, titration after trapping CO_2 in a strong base, potentiometry, ion chromatography [1].

Accurate results could be also obtained by using conversion factors or equations. Hence, for compost samples TOC parameter was determined on the basis of organic matter content (OM) achieved by loss on ignition method with equation TOC = OM/1.84 [4]. Withal, on the basis of OM and "Van Bemmelen factor" (1.724), was estimated the TOC content of chicken litter [5]. Other study [6] present a predictive equation that could be used in commercial composting plants (TOC = 1.703+0.520 OM) and suggest that a factor of 1.8 could be used for practical applications.

Near-Infrared Reflectance Spectroscopy (NIRS) is other technique that could accurately predict TOC from composts and manure. Thus, Huang et al. [7] explored the feasibility of this technique to characterize animal manure compost, meanwhile Malley et al. [8] developed NIRS calibration and evaluated TOC for cattle manure compost.

In addition to the methods presented above, the use of CHNS/O elemental analyzers provides the most accurate and fast results. It works based on catalytic combustion when the carbon is converted to CO_2, hydrogen to H_2O, nitrogen to NO_x and sulphur to SO_2, followed by separation of the gases by GC and detected by thermal conductivity detector (TCD). Total Carbon content (TC) can be investigated splitting it into Total Organic Carbon (TOC) and Total Inorganic Carbon (TIC): TC = TOC + TIC. First analysis sequence provides Total Carbon (TC). Second sequence for Total Organic Carbon (TOC) determination requires samples pre-treatment: Total Inorganic Carbon (TIC) is removed by acidification with hydrochloric acid [9]. For instance, literature studies report TOC content for various inputs: composts produced from slaughterhouse waste [10], fruit and vegetable waste from a supermarket chain [11], pig manure [12], fish waste and seaweed composts destined for organic agriculture [13,14].