Characterization of Green- and Bio-Composts for Horticultural Growing Media

Yosef Amha and Heike Bohne
Institute of Floriculture and Woody Plant Science, Leibniz University of Hannover, Herrenhaeuser Str. 2, D-30419 Hannover, Germany

Introduction

Composting is the biochemical transformation of waste organic matter (OM) by microorganisms whose metabolism occurs in the water-soluble phase (Pullicino et al., 2007). The final composted material consists of, among others, organic fractions varying with particle size, density, and stability to decomposition. Studying the relationships between different fractions of OM and their composition with microbial activity may render an insight about the quality of composts chosen for horticultural growing media.

Materials and methods

The total OM of six green- (originated from twigs and agricultural wastes) and bio- (originated from household wastes) composts was fractionated into four distinct groups (Fig 1) and then correlated with large arrays of the respective microbiological properties to find out a simple parameter that predicts the stability of C and N balances of composts chosen for horticultural growing media. Microbial activity was measured as basal respiration (CO_2 evolution over 10 days) and microbial biomass N and C estimated by fumigation extraction method (Vance et al., 1987).

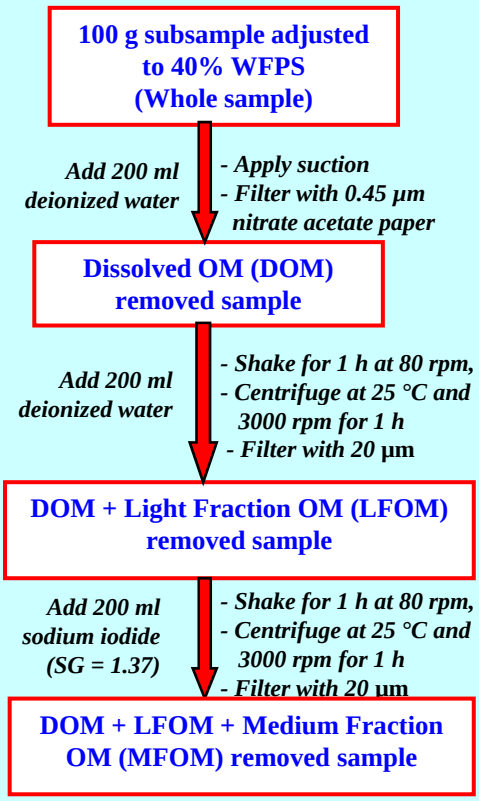

Fig. 1. *Schematic representation of OM fractionation (modified from Cookson et al., 2005*

Results

Table 1. *Correlations between different parameters*

	OM	Total C	Total N	DOM C	LFOM C	MFOM C	HFOM C
CO_2	0.41	0.51	0.34	0.67	0.36	0.22	0.24
MB-C	0.37	0.46	0.29	0.53	0.30	0.12	0.23
MB-N	0.32	0.35	0.28	0.39	0.28	0.15	0.21

- DOM-C is best correlated with microbial activity measured as evolved CO_2 ($r^2 = 0.67$) and microbial biomass-C (MB-C) estimated by the fumigation extraction method ($r^2 = 0.53$) (Table 1).
- LFOM also shows a positive correlation although the computed r-value is small ($r^2 = 0.36$). MFOM and heavy fraction OM (HFOM), however, have no clear pattern.
- Microbial biomass-N (MB-N) shows poor correlation with different OM fractions (Table 1).

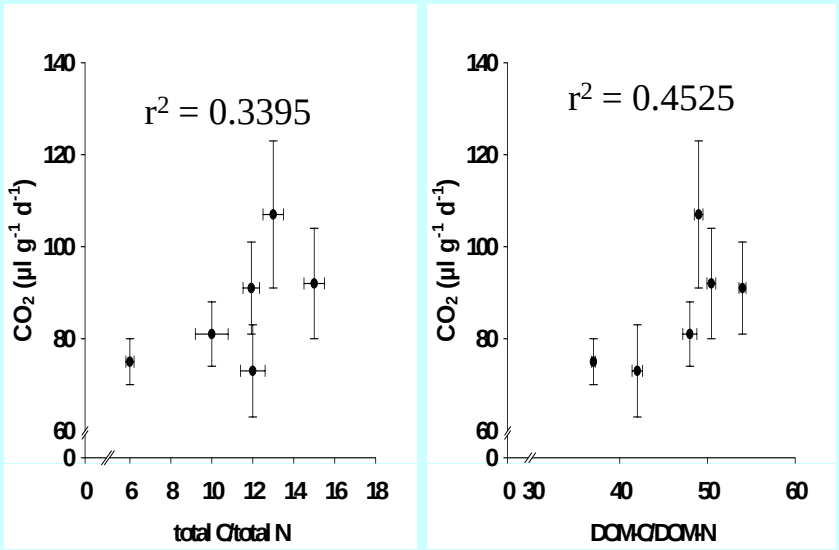

Fig. 2. *Correlations between C-to-N ratio of whole sample and DOM with microbial activity measeured as evolved CO_2 over 10 days*

- The correlation between C-to-N ratio of the DOM and microbial activity is relatively higher ($r^2 = 0.45$) than the C-to-N ratio of the whole sample, $r^2 = 0.34$ (Fig. 2).

Conclusion

Since the separation of DOM is relatively simple (i.e., add water and remove the filtrate by applying suction), it can be used, but in a due connection with other physicochemical properties, as a quality criterion for selecting green- and bio-composts for horticultural purposes. For practical purpose, compost with a higher carbon or lower nitrogen content in the DOM fraction may cause nutrient (e.g., N) immobilisation by increasing microbial activity unless compensated by fertilization.

References: Pullicino et al., 2007. Bioresource Technology 98:1822-1831. Vance et al., 1987. Soil Biology and Biochemistry 19: 703-707. Cookson et al., 2005. Soil Biology and Biochemistry 37:1726-1737