Characterizing stability and dynamics of organic matter in worm compost using Rock-Eval® analysis - preliminary results

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Numerous questions are pending on the role of soil engineers on the organic matter evolution in soil and more generally on the complete biochemical cycle of the carbon. Worm compost, used to enrich the soil with organic compounds, improves soil structure and fertility. As a characteristic product of soil engineers, it is then of high interest to study.

Rock-Eval® thermal analysis allows to quantify the C-H bonds in the organic matter (OM) of a sample through controlled open-pyrolysis. Relying on the hypothesis that thermal stability can serve as a proxy for biogeochemical stability, such analysis is nowadays commonly used to characterize OM in soils (Sebag et al. 2006; Albrecht et al. 2015; Sebag et al. 2016) or to assess the impact of worms on organic matter (Ducasse et al. 2023) both at a field and meso-scales (such as a flowerpot). However, no experimental study exists using a commercial worm composter. In many commercially available worm composters, the trays are periodically rotated downward over the composting time. This action raises the question of whether it is possible to track the temporal evolution of the organic matter extracted from these trays. To answer this question, the aim of our work was to carry out an initial sensitivity test to determine whether the Rock-Eval® signatures of the samples taken are consistent with past work.

We here found that the standard and advanced parameters obtained in Rock-Eval® thermal analysis were consistent with those obtained in natural litter and in the field. In particular, we clearly identified the decomposition of the most labile materials over the composting time (see Fig. 1) and we matched the signature interval of forest humus in the (I,R) diagram with $I \in [0.1 ; 0.5]$ (Sebag et al. 2016).

The conclusions drawn from this initial feasibility study are that it is possible to use this type of worm composter as a model system for studying the impact of earthworms on organic matter thanks to the possibility of isolating the castings over the composting time.

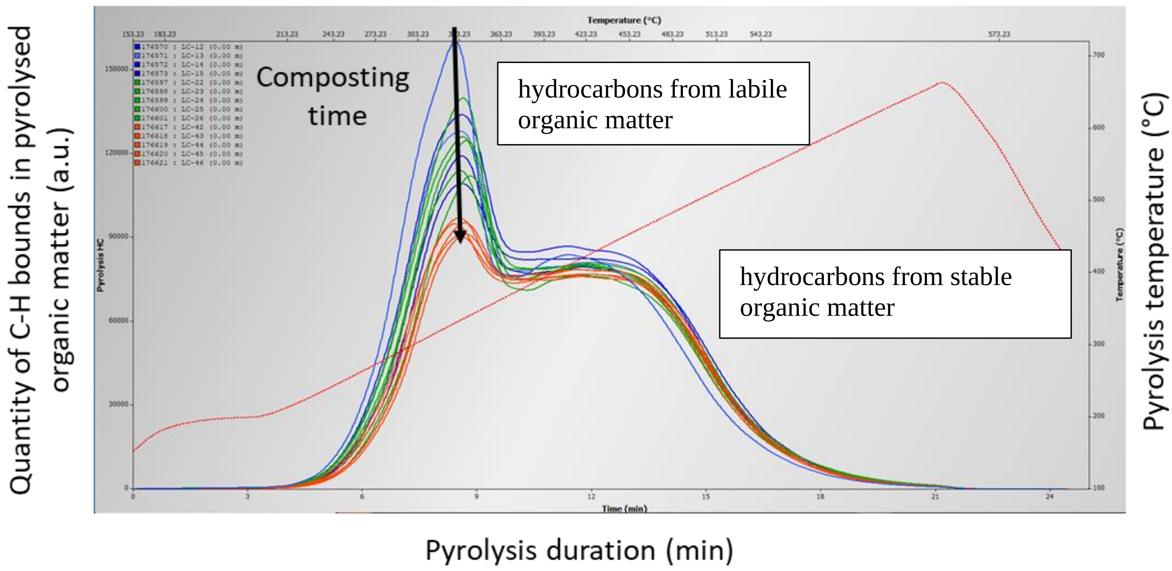

Figure 1: Evolution of the quantity of C-H bounds in pyrolyzed organic matter in casts as a function of composting time.
Sampling was done monthly: blue = sampling month #1; green = sampling month #2; orange = sampling month #3. Reproducibility was obtained based on five replicates. It is shown that hydrocarbon labile compounds significantly decrease on the three months composting duration, while more refractant HC compounds evolve much less on the same period of time.

References:

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