

High temperature composting suppresses humification: process rate and humic substances content

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ABSTRACT

Soil fertilization with compost promotes carbon sequestration, mainly in the form of stable organics, that is, humic substances (HS), including humic acids (HA). Therefore, the technological conditions during composting should enable maximal amounts of HS and HA to be obtained in mature compost. Composting needs to be managed to obtain high temperatures to ensure hygienization. However, particularly at a technical scale, the process tends to be overheated. This study examined the effect of overheating during sewage sludge composting on the rate of HS and HA formation, and the HS and HA concentrations in the final product. Two series were performed: in series 1, the maximal temperature was 72.2°C and the thermophilic phase lasted 12 d, whereas, in series 2, these values were 83.1°C and 20 d, respectively. It was found that overheating affected humification kinetics and reduced HS and HA content. In series 2, the rates of HS formation (r_{HS} 1.70 mg C/g OM d) and HA formation (r_{HA} 1.44 mg C/g OM d) were 2-fold lower than in series 1 (r_{HS} 3.51 mg C/g OM d; r_{HA} 2.92 mg C/g OM d). Similarly, the maximal increases in HS and HA concentrations in series 2 (59.65 and 38.89 mg C/g OM, respectively) were 1.4-fold lower than those values in series 1. However, overheating did not affect the humic acids' elemental composition.

Keywords: Sewage sludge; Composting; Overheating; Humic substances; Humic acids
