From Forest Nursery Notes, Summer 2008

154. © Maturity and stability evaluation of composted yard trimmings. Brewer, L. J. and Sullivan, D. M. Compost Science & Utilization 11(2):96-112. 2003.

Compost Science & Utilization, (2003) Vol. 11, No. 2, 96-112

Maturity and Stability Evaluation of Composted Yard Trimmings

Linda J. Brewer and Dan M. Sullivan
Department of Crop and Soil Science, Oregon State University, Corvallis, Oregon

The objective of this research was to evaluate a variety of stability and maturity indices for yard trimmings compost produced in the Puget Sound region of western Washington State. Compost samples were collected periodically during a 133-d composting cycle at a commercial composting facility, showing that indices of compost respiration rate were sensitive indicators of compost quality. All respiration rate indices identified a period of high respiration rates during active composting (first 27 d), and a period of relatively stable respiration rates during the latter part of curing (70 to 133 d). Chemical tests of compost solids showed less promise as maturity indicators, but provided valuable information on final compost quality. Mature yard trimmings compost had a C:N of 12, an NH_4-N to NO_3-N ratio of less than 4, a cation exchange capacity (CEC) of 400 cmol per kg of compost-C, and a pH between 6.5 and 7.0. Seed germination tests and sensory tests (color and odor) were of limited value in assessing compost maturity. Fully-cured compost produced with forced aeration had a Solvita CO_2 test value of 6 to 7 and a respiration rate via the alkaline trap method of 2 mg CO_2-C g compost-C^{-1} d^{-1}. It reheated less than 2°C in an insulated Dewar flask in a 7 d incubation. Further evaluation and calibration of respiration test protocols for compost quality assurance testing programs are recommended.

Introduction

Maturity is a general term describing fitness of the compost for a particular end use, while stability refers exclusively to the resistance of compost organic matter to further degradation (Sullivan and Miller 2001). Mature composts are ready to use; they contain negligible or acceptable concentrations of phytotoxic compounds like NH_3 or short-chain organic acids. However, some phytotoxic characteristics of compost (e.g. soluble salts, presence of persistent herbicides) are related mainly to feedstock quality.

Generally, less data is available on maturity and stability measures for yard trimmings than for biosolids or mixed solid waste composting systems. State or regional compost testing programs are also seeking calibration data for compost quality indices.

Laboratory tests of compost respiration rate are used to assess compost stability. Such tests generally provide near-optimum conditions for microbial respiration (e.g. moisture, nutrients, and oxygen supply). Respiration is measured by CO_2 evolution rate or O_2 uptake rate (Grebus *et al.* 1994; Iannotti *et al.* 1994; Lasaridi and Stentiford 1998). Self-heating of compost in an insulated vessel is also used as an index of respiration rate (Brinton *et al.* 1995). A decreasing respiration rate in a laboratory test implies a reduction in biodegradable C and increasing C stability.

Compost maturity assessment is more of an art than compost stability assessment, since acceptable maturity varies depending on compost end-use. A wide range of maturity tests have been proposed, but the utility of the tests varies among feedstocks (Sullivan and Miller 2001; Henry and Harrison 1996; Jiménez and Garcia 1989). Immature compost can inhibit seed germination or reduce plant growth via the toxicity of water-soluble organic acids or ammonia (Forster *et al.* 1993; Jiménez and Garcia 1989), or via rapid O_2 consumption and anaerobic conditions in potting media (Brin-