

The Importance of Compost Maturity

Why is Compost Maturity Important?

Compost Needs Stability To Be Mature!

Stability and maturity are terms often used to characterize compost, yet compost specialists have varying opinions about what these terms mean.

The term “stable” typically refers to a compost that is not undergoing rapid decomposition and whose nutrients are slowly released into the soil. Stability is important in determining the potential impact of the compost material on nitrogen availability in soil or growth media.

Stable compost consumes little nitrogen and oxygen and generates little CO₂ or heat. Unstable, active compost demands nitrogen when applied to soil and growth media. Composts that cause nitrogen deficiency can be detrimental to plant growth, even causing death to plants in some cases. If stored improperly and left unaerated, unstable compost can become anaerobic and generate nuisance odors.

Maturity is the degree or level of completeness of the composting process. For mature compost, raw starting materials (feedstocks) have been sufficiently decomposed to produce a stable product. In contrast, immature compost may contain one or more compounds that inhibit plant growth, may contain viable weed seeds, or have other undesirable characteristics, such as odor.

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Many uses of compost require a mature product that prevents nutrients present in the soil from being tied up (immobilized). Therefore, mature compost is important because it will not adversely affect plant development due to reduced oxygen or nitrogen availability and/or the presence of phytotoxic compounds.

However, immature compost products can be used beneficially. For example, conventional growers may apply unstable compost to increase soil organic matter. They may not intend to plant for several weeks, or may not be concerned about a

small amount of nitrogen immobilization from unstable compost. In general, immature compost is used to build organic matter content in depleted soils.

Compost Laboratory Analysis

Maturity cannot be described by a single property, but can be measured by two or more chemical and biological properties. The California Compost Quality Council (CCQC) has developed a numerical “Maturity Index” that uses standard laboratory test methods to rate compost maturity.

CCQC Maturity Index

The CCQC Maturity Index uses a sample’s organic carbon-to-nitrogen ratio as an initial pass/fail screening. A compost sample must have C:N ratio equal to or less than 25:1 to be considered mature enough for further testing. If a compost sample passes this initial screening, it is then subjected to two sets of tests.

Tests from group A measure whether adequate decomposition has occurred by measuring carbon dioxide release or oxygen use. Tests from group B directly measure the level of potentially phytotoxic compounds, like ammonia, in a compost sample. Or alternatively, they indirectly assess whether a compost sample has phytotoxic compounds present by measuring seed germination and/or plant growth.

Length of the Composting Process

State of California Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, section 17868.3, Pathogen Reduction) requires compost producers to adhere to a process to reduce pathogens (PFRP).

For example, in regard to static pile or windrow composting, the regulations require compost sampling to verify an internal temperature of 55 degrees centigrade for 15 days, and be turned a

minimum of five times. These requirements will ensure that pathogens and weed seeds are killed.

However, additional processing beyond the 15 days will allow the compost to further stabilize and mature. Typically, compost is stored between 30 to 120 days to allow the compost to further stabilize. This additional processing time results in compost that is referred to as being “cured.”

General Traits of Very Mature, Mature, and Immature Compost

Very mature compost is a well-cured compost, with the following characteristics:

- Completed the rapid decomposition process.
- No odors.
- No potential to inhibit plant growth.

Mature compost is a cured compost, with the following characteristics:

- Is unlikely to produce odors.
- Has limited potential to inhibit plant growth.
- Has minimal impacts in nitrogen in the soil.

Immature compost is an uncured compost, with the following characteristics:

- May produce odors.
- Has significant potential to inhibit plant growth.
- Has significant potential to impact nitrogen availability in the soil.

End Use Examples of Composts Based on Maturity Index Rating

Based on a compost sample’s rating using the maturity index, appropriate uses include, but are not limited to, the following applications.

Very mature compost:

- Soil and peat-based container plant mixes.
- Alternative topsoil blends.
- Turf grass top dressing.

Mature compost:

- General field use (pastures, hay).

- Vineyards.
- Row crops.

Immature compost:

- Amend fallow soil.
- Add organic matter to depleted soils.
- Feedstock for compost.

Additional Resources on Compost Maturity

“CQC Maturity Index”(final report). Available from CCQC at www.ccqc.org/.

“CCQC Guide to Compost Maturity.” Available from CCQC at www.ccqc.org/.

“Compost: Matching Performance Needs with Product Characteristics.” Publication # 443-00-005 available from the CIWMB, at (916) 341-6306 or www.ciwmb.ca.gov/Organics/.

William Darlington, “Compost: A Guide for Evaluating and Using Compost Materials as Soil Amendment.” Soil and Plant Laboratories, Inc. Available from the CIWMB at (916) 341-6620.

Limitations

Presently accepted methods to evaluate stability and maturity may not completely address the appropriateness for a particular end use. All of the test procedures mentioned in this document and the CCQC Maturity Index report provide indirect interpretations for the potential impact on plant growth.

In most cases these tests and determinations are performed on samples comprised of 100 percent compost. However, compost is used as an additive that may range from 30 percent to less than 1 percent of the total media and soil volume. In the absence of specific tests that evaluate the material based on a particular use, the producer of compost must become more aware of the consumer’s requirements for different end-use markets.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut energy costs, **Flex Your Power** and visit www.consumerenergycenter.org/flex/index.html.