Interpreting Your Compost Test Results

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The results of this test are meant to help evaluate the quality of compost as an agronomic or horticultural resource. *Test Methods for the Examination, Composting and Compost* (TMECC) developed by the US Composting Council have been adopted by the UMass Soil and Plant Tissue Lab for compost analysis.

COMPOST TEST RESULTS

pH - The pH of finished compost should be near neutral (7.0). Values below 6 and above 8 may indicate a problem with the starting materials, the composting process, or both.

Soluble Salts (Electrical Conductivity) – Electrical Conductivity (EC) is a measure of dissolved salts present in the compost using a 1:5 (compost:water) weight ratio. Since dissolved salts conduct electricity they are expressed in terms of the electrical conductivity of the supernate. Compost soluble salt levels typically range between 1 and 10 mmhos/cm. However, acceptable levels are determined on the basis of the intended use of the compost.

Bulk Density - The determination of bulk density allows a conversion of nutrient data to a volume basis (the form in which the compost is handled). The compost (as received) is transferred into a wide mouth volumetric cylinder. It is then shaken gently and tapped lightly to a level surface. Its volume and mass are obtained. It is then dried and weighed again. The mass per unit volume (lbs/ yd^3) both moist and dry can then be determined.

Percent Solids and Moisture Content – The percent solids and moisture content reflect the state in which the sample was received by the lab, and may have limited significance. Compost containing a high percentage of organic matter will have a high water holding capacity (WHC) and moisture content.

Optimal moisture contents may be better defined if the total WHC of the sample is known. Materials containing moisture contents less than 40% of WHC may indicate that inadequate moisture was present in the pile to finish the composting process. At moisture contents greater than 80% of WHC, insufficient oxygen may have been available to finish the process.

Organic matter - Organic matter (OM) content is the measure of carbon-based materials in compost and is typically expressed as a percentage of dry weight. Organic matter is determined by loss on ignition at 550^o C. The amount of OM in a compost sample will depend on the nature of the starting materials and the degree of decomposition. Most finished composts tested by this laboratory have a 25-40% OM.

There is no ideal organic matter content for finished compost. If all factors related to the biochemical breakdown of raw substrates are ideal, a final organic matter percentage near 30% by weight is common. The remaining 70% is mineral matter and ash.

Nitrogen - Compost can be a significant source of nitrogen (N). Nitrogen is analyzed as total, organic, nitrate-N and ammonium-N. Measuring the total N content and the current levels of nitrate-N (NO^3-N) and ammonium-N (NH^4-N) of compost is straightforward.

Total Nitrogen

Most compost contains about 1% total N on a dry weight basis (~7 lbs/yd^3). This means that an application of 50 dry tons per acre would add 1,000 lbs N per acre. Only a small proportion of this N will be available to the crop the first year. If the compost is finished, one can usually assume that about 10% of the total N will become available during the year of application.

A total N level between 0.75% and 2.5% is normal. Values below this range often indicate a high mineral content in the compost (OM less than 20%). This may indicate that it has been diluted with soil or that the composting process has proceeded to an advanced stage and that some amount of soil material was included in the original compost recipe. Starting materials low in N may also be a contributing factor. Nitrogen contents above 2.5% are most often associated with high organic matter levels (>60%), and/or nitrogen-rich starting components. Evaluating other test values and knowing the compost's history and

appearance will usually reveal which of these conditions exist.

Organic Nitrogen

Organic N is the fraction of the total nitrogen that is chemically associated with carbon in some form. In mature composts, organic nitrogen should explain most of total nitrogen present. It is determined by subtracting the inorganic N forms, NO^3-N and NH^4-N from total N. Evaluating the "availability" of that N to a growing crop is more difficult.

Nitrate and Ammonium

Nitrate-N and Ammonium-N are the common mineral forms of nitrogen in compost. One feature of composts nearing completion is the production of nitrate-N. This may be an indication that nitrogen in excess of that required to further decompose carbon substrates may be present. Nitrate levels as high as 1000 mg/kg are common. This nitrogen is readily available to plants, but leaches easily if not used.

Ammonium-N levels in well-managed composting operations are usually low (<100mg/kg). High levels may indicate poor aeration, excessively wet conditions, nitrogen-rich starting materials, and/or an actively decomposing mixture. High ammonium-N levels at high pH can result in gaseous losses of nitrogen. The use of such composts in large quantities can severely damage sensitive plants.

Total Carbon – Total Carbon (C) is a measurement of all organic and inorganic carbon in the compost sample. Unless the sample has a high pH (>8.3) or is known to contain carbonates, essentially all carbon will be in the organic form. Compost organic matter typically contains around 54% organic carbon by weight, and may be calculated from the organic matter percentage.

C: N Ratio - The C:N ratio is the relative proportion of total carbon to total nitrogen in the compost. A "typical" compost recipe may start with a C:N ratio of about 30 (30 parts C to 1 part N). As composting proceeds, microbes in the mixture use the carbon substrates as their main energy source, oxidizing it and releasing carbon dioxide gas. Assuming that nitrogen is conserved (not lost as a gas or leached) in a moist, well-aerated pile, the C:N ratio decreases with time. Depending on the nature of the starting materials, a final ratio of 15 to 20 generally indicates a finished product. As stated for total nitrogen, an evaluation of other test values and knowledge of the compost's history and appearance can help interpret C:N ratio values.

Macronutrients – Phosphorus (P), Potassium (K), Calcium (Ca), and Magnesium (Mg) are reported in their total forms from acid digestion. Results are reported on a percent dry weight basis, percent moist (as received) basis, and on a moist (as received) volume basis. Values given indicate the total nutrient value of the compost sample. It has been estimated that 50% of P, Ca and Mg, and 85% of K are available the first season of application.

Micronutrients – Boron (B), Zinc (Zn), Copper (Cu), and Iron (Fe) are reported on a dry weight basis in mg/kg, and indicate the total nutrient value of the compost sample. Little information is available to interpret the significance of these values in compost.

Heavy Metals – Lead (Pb), Nickel (Ni), Cadmium (Cd), and Chromium (Cr) are also reported on a dry weight basis in mg/kg, and indicate the total level of metals in the compost sample. Regulations governing the heavy metal content of composts derived from certain feed stocks have been promulgated on both the State and Federal levels. Certain heavy metals are known to cause phytotoxic effects in plants at high concentrations and specific plant species are known to be more sensitive than others. However, little information is available to interpret the significance of these values in compost.

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