



SUMMARY INTERPRETATION OF WASTE & COMPOST TESTS

(full version of document may be purchased on Woods End's website)
prepared by Woods End Laboratories, Inc



Total Solids / Moisture / Water Capacity: Ideal moisture depends on a sample's water holding capacity (WHC).

pH and Carbonates (CO₃⁻): The pH of waste and composts must be carefully interpreted in view of actual acidity and alkalinity. Carbonate containing composts carry real lime neutralization potential that should be factored into land application programs

ORGANIC MATTER: The combustible content or "volatile solids" (VS) fraction is typically measured by total weight loss from furnace combustion or total-carbon by combustion equipment. The OM test forms the basis for determining the sample C:N ratio (see later).

NITROGEN: total-N, organic-N, ammonium, nitrate, nitrite: The quantity and form of nitrogen is important to overall quality and includes all N from nitrate, ammonium and organic-N forms, and this N value is used to determine the CN by division.

CARBON:NITROGEN RATIO: C:N figures are used generally to assess the extent of decomposition of composts and a product may be stable anywhere around a C:N of 17 or lower, unless coarse woody material remains- and this is dependent on lab sieving techniques. In some regions, a product is not considered to be a compost unless the C:N is less than 25:1.

MINERALS- Phosphorus, Potassium, Calcium, Magnesium, Sodium, Manganese, Zinc: These minerals are reported in their total forms from acid digestion. An optional test can be performed to determine the official amount of available P. For estimating the amount of nutrients available the first season, we suggest you take 50% of the P, Ca and Mg figures and 85% of the K and Na figures.

SALINITY, ELECTRICAL CONDUCTIVITY: Soluble salt level (salinity) in a sample is estimated based on measurement of the electrical conductivity of a saturated paste extract (SP), and sometimes using 1:5 water extracts. Salinity enormously affects crop performance especially in intensive farming and gardening.

INERT (OVERS) CONTENT: Oversize matter that does not pass a 1/4" standard sieve (6.5mm) is shown in the report as *inert oversized matter*.

DENSITY: Woods End measures density on the sample as it is received, at a packing pressure simulating a pile depth of four feet. The result is reported in lbs/cu.ft, and lbs/cu.yd.

RESPIRATION RATE: (Carbon-Dioxide Evolution): The total quantity of carbon evolution *in relation to wet weight or volatile solids* indicates the potential for self-heating and weight/volume reduction, and relative stability. The actual procedure is based on capturing carbon-dioxide in lab incubation (after a 24-hr equilibration period) at 34°C.

DEWAR SELF-HEATING TEST: This test is based on a well-known method for measuring actual reheating in a special 1-liter "Dewar" flask. The method provides information that differs from other stability tests.

HEAVY METALS: Trace elements and metals in composts are important for understanding quality and contamination. While USEPA limits are widely applied for regulation some states apply more stringent "Class-A" rules. We recommend use of international EU-CEN standards for all non-sludge composts.

VOLATILE FATTY ACIDS (VFA) and ODOR-INDEX: VFA is an indicator of aero-tolerant anaerobic fermentation leading to odor formation, phytotoxicity or positive methane potential. Woods End has adapted the chemical odor index for each acid to yield an overall odor ranking, shown with each report.

PHYTOTOXICITY and Seedling Growth Response: Phytotoxicity or poor plant response can result from several factors including high amounts of heavy metals, oxygen demand, salts, ammonia, and volatile organic acids. Woods End has standardized a phytotoxicity procedure using cress seedlings

SOLVITA® MATURITY TEST: The Solvita test is a rapid, colorimetric procedure which measures the CO₂ respiration and ammonia (NH₃) evolution in a specified volume of compost. It enables producers and users to make on-the-spot quality determinations.

PATHOGENIC ORGANISMS/ Indicator Microbes: The content of potential human pathogens depends on the treatment and age of any organic waste. Pathogen tests required by EPA may include *Salmonella* (or) fecal *Coliform* (and in certain cases). Compost and organic amendment hygiene is of great significance for end-use food production and it is unacceptable to have detectable *E. coli* or *Salmonella*, or fecal coliform greater than 1,000 MPN/g. The USDA has established cleanliness standards for compost teas, which are < 135 cfu/ 100 ml *E. coli*. Any compost containing appreciable *E. coli* (>100 MPN) should be examined for *E. coli* 0157:H7 which should be non-detectable at < 0.02 cfu / g (< 1 /50g).

MATRIX Classification- Compost classification is performed by means of a statistical multi-array using actual analytical test results. The array scores the goodness of fit or “match” within a best use category. There are 6 types of use recognized. The minimum level score to meet any category is 75%.

COMPOST ANALYTICAL PROCEDURES REFERENCE (incomplete list)

Physical Parameters	Units	METHODS REFERENCES ¶
Water Holding Capacity (WHC)	g 100g as is	WERL
Total Solids (alt. Moisture Content)	g 100g TS	TMECC 03.09
Dewar Self-Heating	Tmax in °C	BGK, TMECC 05.08D
Man-Made Inerts, Plastic, Glass, metal	g 100g TS	modified BGK
Chemical Parameters		
pH, saturated paste	- log H ⁺	EPA 150.1; TMECC
Volatile Organic Acids (VOA, VFA)	mg kg TS	SM 5560C / HPLC-UV
Conductivity (EC), saturated paste/slurry	dS m	TMECC 04.15
Volatile Solids (VS) (Loss on Ignition)	VS dm	modified TMECC 03.02
Total Nitrogen (TKN)	TN% dm	ASTM, TMECC, MAP
Ammonium Nitrogen (NH ₃ + NH ₄)	NH ₄ -N ppm	SM4500-NH3G
Nitrate and Nitrite Nitrogen	NO ₃ -N, NO ₂ -N ppm	MAP; HPLC UV
P K Ca Na Mg Cl Fe Mn Cu Zn Cr Pb Cd Ni	mg kg TS	SM, MAP
Al As B Hg Mo Se	mg kg TS	TMECC 04.06
Biological & Microbiological Parameters		
Respiration Rate (CO ₂ -Evolution)	CO ₂ -Cmg g TS day	TMECC 5.08A ^Ø
Solvita Test CO ₂ - and NH ₃ -volatilization**	0 - 8 CO ₂ / 1 - 5 NH ₃ -	TMECC 5.08E
<i>Salmonella</i> (EPA 503)	MPN 4g TS	EPA #1682
<i>Fecal Coliform</i> (EPA 503)	cfu g TS	EPA #1680
<i>E. coli</i> / <i>E. coli</i> 0157:H7	MPN g TS	EPA 1680 + SM9221F
<i>Fecal Streptococcus</i>	MPN g TS	modified FDA BAM
<i>Clostridium perfringens</i>	MPN g TS	SM9230B
	cfu g TS	modified FDA BAM
Cress Test, Phytotoxicity	% of Fafard Control	OECD, ASTM, ACSD, BGK
Disease Suppression	% inhibition	Hoitink, Krause et al.
Lemma spp. (Duckweed) Toxicity Test	% inhibition	modified after SM 8211-A.
Viable Weed Seeds	>0.8 / liter	TMECC 05.09-B
Herbicide BioAssay	0 - 5 severity scale	Bull. Env. Contam. Tox 2006

TEST METHOD REFERENCES

AOAC - Official Methods of Analysis 17th Edition (2004)	ASA-SSSA - Methods of Soil Analysis, American Society of Agronomy, Soil Sci. Soc., Madison WI
ASTM- American Society of Testing Methods, Philadelphia <i>published on-line</i>	BAM- Bacteriological Analysis Methods On-Line
BGK - Bundesgutegemeinschaft Kompost (Germany Compost Association) Test Methods Manual 1998	EPA-600 - Methods for Chemical Analysis of Water and Wastes. US EPA (RCRA)
MAP- Manure Methods of Analysis. Univ of Wisconsin A3769 (2003)	OECD - Guidelines for Seedling Emergence and Seedling Growth Test #208,
SM - Standard Methods for the Examination of Water & Wastewater, 20th ED. Water Env Federation	SW-846 - Test Methods for Evaluating Solid Waste USEPA 1987 (NPDES)
TMECC- Test Methods for Examination of Compost. (2002) Privately published manual U.S.Compost Council (a trade organization)	WERL - Woods End Research Lab Standard Operating Procedure Manual - Internal Document
ACSD - Association of Swiss Composters, Methods Manual (2003)	