st Method:	Viable Weed in Compost					Last Revised:	01/24/26 SRH	
	5.9-A: Shields Rinse Method					Units:	count (4 L^{-1})	
	5.9-B: Peat Moss Dilution Method					Units:	count (4 L^{-1})	
Test Method Applications								
Process Management							**Product Attributes**	
Step 1: Feedstock Recovery	*Step 2:* Feedstock Preparation	*Step 3:* Composting	*Step 4:* Odor Treatment	*Step 5:* Compost Curing	*Step 6:* Compost Screening and Refining	*Step 7:* Compost Storing and Packaging	*Safety Standards*	*Market Attributes*
						5.9-A		5.9-A
						5.9-B		5.9-B

5.9 Viable Weed Seed in Compost

Keywords

Emergence, Germination, Peat moss dilution; Rinse method; weed seed

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Method 5.9-B: Peat Moss Dilution Method - *Dr. William F. Brinton, Jr.*

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Disclaimers

The methods in this manual (Test Methods for the Examination of Composting and Compost, TMECC) do not address all safety concerns. Users are responsible for establishing appropriate safety and health practices, reviewing current Safety Data Sheets, and determining regulatory applicability before use. Safety measures including personal protective equipment, ventilation, handling, storage, emergency response, and waste disposal must comply with current

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institutional and regulatory standards. Chemical hazards and requirements vary by substance and jurisdiction and may change over time. This manual does not provide comprehensive safety information; users must consult current regulations and manufacturer instructions. Failure to follow proper procedures may result in injury, environmental harm, or legal violations.

All methods and sampling protocols are subject to revision to correct errors or reflect advances in practice. Report omissions or errors to the TMECC editors. Process alternatives, trade names, or commercial products mentioned are provided as examples only and do not constitute endorsement.

Values stated in International System of Units (SI) are to be regarded as the standard. Values given in parentheses are provided for information only.

Scope

These methods determine the quantity and germinability of weed-seeds in compost.

Significance and Use

Determination of weed-seed content may improve understanding of weed infestations that arise from composts and potting media. The origin may be hypothesized by examining the botanical composition of the weed species present within the region of a composting facility. Properly prepared compost is relatively weed-seed free. Weed-seed in a compost indicates that the material may not have been adequately processed or that the finished compost was contaminated from the air or stored on or mixed with material containing weed-seed.

Even though weed-seeds might be deposited onto the surface of curing piles, the presence of significant numbers of viable weed-seeds in compost might indicate that ordinary seed destruction processes failed during composting.

Viable weed-seed determination is useful for product quality assurance in specialized markets that are sensitive to weeds in substrates (e.g., horticultural and mulch). Weed-free compost reduces the time and expense of weeding and is a more marketable product.

Terminology

Botanical composition — The compositional makeup of plant type as presented by species.

Dormancy — The condition or state of seeds of many non-cultivated species, which do not sprout when first exposed to adequate moisture, temperature, and oxygen.

Germination inhibition — Any of several conditions induced through the occurrence of one or many edaphic factors at levels that diminish the viability of a seed; common factors include salt concentration, volatile organic acids, and adequacy of oxygen, i.e., maturity in compost.

Media dilution — The dilution on a volume basis (v/v) with any compost with a standard agent, such as peat moss, to achieve standard conductivity.

Germinable plant part — Any portion of a plant, rootlet, or stem capable of vegetative reproduction, i.e., rhizome, etc.

Viable weed — A germinable weed-seed. A weed-seed capable of germinating under optimized conditions in the test sample. Does not include dormant weed-seeds.

Weed-seed — undesirable viable seed.

Interference and Limitations

The aliquot used with this test is assumed to represent the compost bulk in question accurately. Sample size can be a limiting factor. It is advisable to sample the windrow surface (0 to 15 cm) separately from the windrow core, specifically when infestations of weeds from air-borne sources are observed to occur.

Excessive salts, the presence of readily available organic carbon that can produce anaerobic conditions, and other phytotoxins that suppress seedling germination must be diluted or eliminated to facilitate viable seed germination. Salts interfere with the germination of many weed-seeds with wide variation among species. To remove this interference, dilution of material volume to decrease the conductivity to less than 2 deciseimens/meter (dS/m) is generally considered adequate.

This test does not address factors that break dormancy of weed-seeds. The presence of dormant seed is not specified in the sample preparation section. Edaphic factors that break seed dormancy vary with plant species. It may be necessary to replicate this test for each seed dormancy factor identified for the region of interest.

It may be necessary to introduce steps that emulate conditions of other climates. This test was devised for composts applied to the receiving soil in the current growing season. If the compost will be applied in the fall with plans for spring planting, it may be best to subject the compost sample to freeze-thaw cycles before testing to simulate the climate conditions.

Nutrients and other factors present in organic amendments may enhance germination and growth of weed-seeds already present in soils. Field trials are recommended if weed problems persist, despite test results.

If the positive control (radish) germinates poorly in a standardized mix, it may indicate phytotoxic factors present that the proposed dilution did not eliminate. It is unknown if those factors would affect weed-seeds to the same extent as they do radishes.

5.9-A Shields Rinse Method

1. Summary of Method 5.9-A: Shields Rinse Method

A known and representative volume of compost prepared by repeated soaking in deionized water until the soluble salts are reduced. The prepared compost sample aliquot is filtered and spread onto a layer of sand and incubated at 27 °C for 21 days. Emerged weed-seedlings are counted, recorded, and removed. The number of common, fast germination weed-seedlings recorded can be indicative of more problematic weeds present that take longer than the 21 days to germinate.

2. Sample Handling for Method 5.9-A: Shields Rinse Method

The sample size is four liters (L).

Store compost samples at as-received moisture at 4 °C until the test starts and no more than seven days. Seven-day refrigerated storage is assumed to be the maximum allowable storage time for samples destined for biological analysis. Avoid freezing the sample, especially when the sample source has a climate where freezing rarely occurs.

3. Apparatus for Method 5.9-A: Shields Rinse Method

Vacuum — wet/dry, 18.9 L (5 gallons [gal]) capacity).

Bucket — plastic, 18.9 L (5 gal).

Pail — plastic, 11.4 L (3 gal), with the bottom removed.

Incubator — capable of maintaining a temperature of 27 °C ± 1 °C.

Electrical conductivity meter — single channel conductivity meter, conductivity accuracy (±) 0.5 %.

Screen mesh — plastic, 300 μm mesh, secured to the bottom of the 11.4 L (3 gal) plastic bucket.

Plastic Trays — 10 cm (4 inches [in.]) high, with a cumulative surface area of 4500 cm^2.

Radish (*Raphanus sativus*) *seeds* — Untreated seed, germination certified.

4. Reagents and Materials for Method 5.9-A Shields Rinse Method

Sand — quartz, # 20.

Water — deionized, minimum resistivity 17 MΩ /cm.

5. Procedure for Method 5.9-A: Shields Rinse Method

a) Prepare a plastic tray by forming a level 2.5-cm layer of sand across the bottom of the plastic box.

b) Remove salts from compost test sample by first transferring 4 L of compost to a 18.9 L (5-gal) bucket. Next, add 12 L (3.2 gal) of deionized water to compost sample and thoroughly mix. Measure electrical conductivity of the mixture. Then, place the plastic bucket with screen mesh bottom into compost water slurry and move in short, quick up and down motions while lowering the bucket as it fills with water. Remove as much water as practical using the wet/dry vacuum. Repeat until electrical conductivity is < 2.0 dS/m, which may take 3 to 4 repetitions.

c) Spread the 4 L of prepared (salt and organics-reduced) compost evenly across the top of the sand in the plastic tray.

6. Positive Control for Method 5.9-A: Shields Rinse Method

a) Distribute ten radish seeds across the prepared compost test sample at known, recorded locations in the tray.

d) Cover the tray with a transparent cover to minimize evaporative water loss. Record the sample identifier and date on the side of the tray for future reference.

e) Maintain the prepared tray at 27 °C ± 1 °C for 21 days. Monitor regularly for the presence of weed seeds. For botanical classification, it may be necessary to allow weeds to grow out for up to 6 weeks in the test media.

f) Count and remove radish seeds as they germinate.

7. Calculations for Method 5.9-A: Shields Rinse Method

Calculate the percent viability of radish seed control:

$C = (R \div 10) \times 100$ *Equation 5.9-A1*

Where:

C = percent of viable seeds for control

R = number of viable control seeds

10 = initial number of control seeds planted

100 = factor to convert the ratio to percentage

8. Report for Method 5.9-A: Shields Rinse Method

Report the number of viable weed-seeds per 4 L of compost. Report the percent recovery for the radish seed control. Report test conditions: pre-test storage and temperature cycling, incubation temperature, light cycle, and test duration. Specify weed-seed dormancy factors employed to break seed dormancy.

9. Precision and Bias of Method 5.9-A: Shields Rinse Method

The resolution of this test is less than 1 weed per 4 L of compost. The bias of this test has not been determined. Replication using multiple samples from one compost production batch or windrow may be necessary to estimate the incidence of weed-seed in compost.

Randomly extracted aliquots should be used as replicates to approximate test results' relative accuracy and reliability.

5.9-B Peat Moss Dilution Method

1. Summary of Method 5.9-B: Peat Moss Dilution Method

A quantitative procedure that standardizes the conductivity of compost by dilution with limed peat. The test determines the content of viable weed-seeds and germinable plant parts and reports them per 4 L of the test material. The test requires 14 days and compost diluted to a standard conductivity volume.

2. Sample Handling for Method 5.9-B: Peat Moss Dilution Method

The sample size is 4 L of compost in addition to the amount needed for performing *Method 4.10: Electrical Conductivity for Compost*. Compost is sampled to include all representative

fractions as described in *Method 2.1-C: Selection of Sampling Locations for Windrows and Piles*.

Peat is obtained and prepared with limestone a minimum of one week before testing.

Large volume trays must be available to accommodate the potentially significant dilutions.

3. Apparatus for Method 5.9-B: Peat Moss Dilution Method

Seedling flats — Standard plastic planting trays, 25 cm × 50 cm. Two to ten trays are used for each trial, and the quantity is proportional to the conductivity. Trays should have transparent tray covers that permit aeration and minimize evaporative water loss during germination. Alternatively, trays are placed uncovered in a growth chamber of controlled humidity of 70 ± 5 %. The test blend will be 1.25-cm deep in trays; the number of required trays may be calculated for any standard conductivity:

$$X = EC \div (2 \div DSC) \qquad \textit{Equation 5.9.B1}$$

where:

$X =$ required number of trays

$EC =$ electrical conductivity in dS/m

$DSC =$ target diluted standard conductivity (assumed in this method to be 2 dS/m). For practical purposes, if the method is used at the suggested target EC of < 2 dS/m, then the number of required trays equals the conductivity, but never less than two trays

Lighting — grow-light conditions providing a minimum of 25000 lumens/m at the media surface. Day length shall be 12 to 16 hours. Night light conditions should be tungsten 45 Watt (ISO, 2012).

Radish (Raphanus sativus) seeds — untreated seed, germination certified. Source: Johnny's Selected Seeds Albion Maine, 04910 (or equivalent source). Alternatively, barley (*Hordeum vulgare*) may be used as it is a standard test plant for phytotoxicity trials (ISO, 2012).

4. Materials for Method 5.9-B: Peat Moss Dilution Method

Sphagnum peat moss — untreated (lime free and not fertilized), light undecomposed moss peat, Van Post scale H 1-3; proper sphagnum peat moss contains 75 % by dry weight of sphagnum fibers and a minimum of 90 % organic matter by loss-on-ignition. Source: Fafard or Premier peat, or equivalent.

Limestone — finely ground agricultural grade limestone, $CaCO_3$ with a minimum of 32 % Ca, or dolomitic limestone $CaMg(CO_3)_2$ with a minimum of 20 % Ca and 12 % Mg. Fineness of grind: 98 % should pass a 20 mesh, and 40 % should pass a 100 mesh; material coarser than this requires considerably longer to equilibrate with peat.

5. Procedure for Method 5.9-B: Peat Moss Dilution Method

a) Prepare standard limed peat by adding 12.6 g limestone per 1 L peat moss or other rate determined empirically to bring about the requisite pH change. This pre-mix should be allowed to stand for not less than one week before use to allow equilibration. The final pH of the peat base should be 6.2 ± 0.5. This pH can be measured using TMECC Method

4.11-A: 1:5 Slurry pH). If the desired pH is not achieved, repeat the operation with the same material using smaller lime increments, also repeating the pH test procedure. This limed peat base is stable and may be stored for three months. Repeat pH tests every three weeks of storage or within one week of any batch of testing.

b) Measure and record the electrical conductivity of the test compost using TMECC Method 4.10-A: EC 1:5 Slurry Method, Mass Basis.

c) Dilute with peat to arrive at a target < 2 dS/m in the final mix based on the electrical conductivity of the test compost. Use Equation 5.9-B2 to determine the volume of peat required for dilution.

d) Lay sieved (<9.5 mm) compost + peat blend in trays to a depth of 1.25 cm and bring to field capacity with water, i.e., approximately 70 % of water-holding capacity. Re-moistening trays with proper set-up should be unnecessary in the first 3 to 4 days. Temperature should be maintained at 20 °C to 22 °C for the duration of the experiment. Examine trays regularly and maintain field capacity moisture status, misting with water when needed to keep the compost surface moist.

e) Record the number of weeds that emerged at the end of 14 days and report the number of viable weeds and germinable plant parts per 4 L of compost.

6. Positive Control for Method 5.9-B: Peat Moss Dilution Method

a) Prepare two positive controls. Add a total of 25 radish seeds in rows 2.5-cm apart to each tray (one tray has been prepared with standard limed peat and the other has been prepared with a compost/peat blend). A peat tray is unnecessary if the compost has not been diluted.

b) Cover with 1 cm of the substrate (peat or compost/peat mix).

c) Count radish emergence after five days. Acceptable germination: The two controls should agree within 10 ± 2 %. The acceptable response of radish in test media with compost is 90 ± 5 % multiplied by the tested germination rate of the seed imprinted on the seed package. If the germination percentage of radish is significantly less than the peat, it may be advisable to repeat the test procedure at another higher dilution ratio of compost. If both controls (peat and peat + compost) give poor results, repeat the test with a new supply of test seeds.

7. Calculations for Method 5.9-B: Peat Moss Dilution Method

Calculate the required dilution of compost media as the ratio of peat to compost in compost + peat blend.

$X = (B - 2)/(2 - C)$ *Equation 5.9-B2*

where:

$X =$ Ratio of peat moss to compost in the compost/peat blend, v/v basis, (e.g., 1.0 means one-part peat to each part compost, or a 50 % dilution)

$B =$ electrical conductivity of compost before dilution, in dS/m

$C =$ electrical conductivity of peat before the test

8. Precision and Bias of Method 5.9-B: Peat Moss Dilution Method

The resolution of this test is less than one weed per 4 L of compost. Bias had not yet been determined.

9. Report for Method 5.9-B: Peat Moss Dilution Method

Report as the number of viable weed-seeds per 4 L of compost. Report germination rate of positive control in peat and peat + compost blend.

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