GETTING STARTED WITH VERMICOMPOSTING

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Vermicomposting is a process that relies on earthworms and microorganisms to help stabilize active organic materials and convert them to a valuable soil amendment and source of plant nutrients.

Why Vermicompost?
- Keep food waste out of landfills
- Stop air and water pollution!
- Can do it indoors
- Requires little space and labor
- Produces free soil amendment that does this to plants...

Why Compost Food Scraps?
- Keep it out of landfills and sink disposals!
- Food is ~1/4 of waste going to landfills!
- Landfills: 3rd highest human source of methane emissions

Vermicomposting
- 2-3 months
- Mesophilic
- Passive aeration, no turning

Composting
- 6 – 9 months
- Thermophilic
- Requires aeration or turning

These are two separate methods that should not be combined!
Vermicompost sells for $200 - $1,200 per cubic yard

Compost sells for <$30 per cubic yard

Who is Vermicomposting?
- Households
- Schools/daycare
- Farms
- Community gardens
- Restaurants
- Grocery stores
- Universities & colleges
- Paper mills
- Military bases
- Hospitals
- Prisons
- Businesses

People in 118 countries have contacted me about vermicomposting

Earthworm Basics
- Cold-blooded animal
- Hermaphroditic
- No lungs: breathes through skin
- Die if skin dries out
- Light can cause paralysis in ~60 minutes

 Aren’t All Earthworms Alike?
- ~9,000 species of earthworms
- Half-inch to 12 feet long

Three Earthworm Ecological Groups

- **Anecic**
  - Live in soil (vertical burrows)
  - Eat soil & litter

- **Endogelc**
  - Live in soil (horizontal burrows)
  - Eat soil

- **Epigeic**
  - Live in litter (no burrows)
  - Eat litter, manure, decaying organics


**Best Epigeic Species for Vermicomposting**  

*Eisenia fetida* (eye-SEN-ee-a FEH-tid-a)

- Adapts well to living in a bin
- Tolerates wide range of environmental conditions

**Invasive Earthworm Species**

- *Eisenia fetida* earthworms do not cause problems in the environment
- 6 out of 9,000 species of earthworms alter forest floors
- Every piece of ground will have these worms eventually
- NC mountains have had invasive worms for 50 years

**Where to Get Eisenia fetida**

- Start with 1 pound (~1,000 worms)
- Don’t get from yard or bait shop

**Eisenia fetida Needs**

- Temperature: 60–80°F (tolerate 32–95°F)
- Moisture: 80% (tolerate 60–90%)
- pH: 7.0 (tolerate >5 - <9)
- Ammonia & Salt sensitive
- Oxygen

**Eisenia fetida Egg Cocoons**

- Lemon-shaped
- Shiny, light brown
- Size of a match head
- 2-7 babies emerge from cocoon in 4-6 weeks
- Babies reach sexual maturity in 7.5 to 11 weeks

**What Will Worms Eat?**

- Compost
- Livestock manure
- Vegetative food residuals
- Spoiled grain
- Coffee grounds
- Brewery waste
- Yard debris
- Cardboard
- Scrap paper
- Agricultural crop residues
Step 1: Build or Buy a Worm Bin

Make Your Own Bin: Drill Holes for Air and Drainage

- Air: around upper sides of bin
- Drainage: six holes on bottom (1/4-inch)

Do not drill holes in lid!

Rhonda’s Fave

Where to Put Your Worm Bin

- Garage
- Kitchen
- Basement
- Living room
- Bathroom
- Laundry room
- Closet
- Shady spot outdoors

Step 2: Add Bedding to Worm Bin

Bedding helps keep bin moist, dark, and discourages fruit flies

Step 3: Gently Add Earthworms
Step 4: Add Food Waste to Bin
- Use 3-prong garden tool
- Pull back bedding
- Put in food
- Cover with bedding
- Do not bury food in castings
- Wait until food is gone before add more

Cover completely to prevent fruit flies and odor

Collecting Food Scraps
- Freezer
- Buy a container
- Reuse a container

Kitchen Scraps for Worm Bin
- Vegetables
- Fruit
- Coffee grounds
- Tea leaves
- Bread
- Pasta

DO NOT Put in Worm Bin
- Meat, grease, bones
- Dairy products
- Cat or dog feces
- Vegetables processed with vinegar
- Hot peppers, onions, garlic
- Citrus fruits & rinds
- Very salty or sugary foods

Particle Size Affects Decomposition Rate
- Same particle chpped up has more surface area

THIS!

NOT THIS!

4/5/2021
Healthy Worm Bin Traits

- Inside smells earthy like forest
- <6 earthworms are on sides, lid of bin
- Food not visible
- Bedding has air spaces
- Contents damp, not soggy
- Earthworms have moist, glistening skin
- Bedding disappearing over time
- Small quantities of other critters in bin
- Castings accumulating on bottom

Harvest Vermicompost

Method #1: Light Separation

Method #2: Sideways Separation

Method #3: Vertical Separation

Harvest Vermicompost

- Fully-stabilized organic soil amendment
- More microbially-active than parent organic material
- pH is near neutral
- High water-holding capacity
- Fine particulate structure
- Contains nutrients in forms readily taken up by plants
- Has humic acids and plant growth hormones (gibberellins, cytokinins, auxins)
**Beneficial Effects of VC on Soils**
- Adds organic matter
- Adds beneficial microbes and enzymes
- Improves soil structure
- Reduces erosion
- Increases soil porosity
- Retains moisture
- Breaks up clay soils
- Increases cation exchange capacity
- Eases cultivation
- Improves soil aeration
- Reduces soil compaction
- Reduces bulk density
- Enhances soil fertility
- Helps prevent soil crusting
- Reduces pH
- Provides plant available macro- and micronutrients

**Vermicast Effects on Plants**
- Increased rates of germination, growth, flowering and fruiting
- Improved root development and stress tolerance
- Decreased transplant shock
- Decreased plant pathogens, parasitic nematodes, insect pests

**Google Scholar**

**Published Journal Articles**

(April 5, 2021)
- Vermicompost effects on plant growth: 32,000
- Vermicompost suppress plant disease: 7,360
- Vermicompost suppress plant pests: 8,640
- Vermicompost suppress plant parasitic nematodes: 2,040

**Mix Vermicompost into Soil**
- Gardens
- Lawns
- Trees
- Nurseries
- Farms
- Vineyards
- Golf courses
- Turf
- Houseplants

**Adding Vermicompost to Soil**

<table>
<thead>
<tr>
<th>10% by Volume</th>
<th>20% by Volume</th>
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</thead>
<tbody>
<tr>
<td>½-inch VC to 4.5-inches soil</td>
<td>1-inch VC to 4-inches of soil</td>
</tr>
<tr>
<td>1-inch VC to 9-inches soil</td>
<td>2-inches VC to 8-inches soil</td>
</tr>
</tbody>
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Spread ½-inch to 2-inch layer of vermicompost on soil surface, then till it in to depth necessary to achieve volume needed.

**Vermicompost Application Rates**
- **Established plants**: Add 2T per quart potting mix around base of plant, water it in. Repeat every 2-4 weeks.
- **Seedling establishment**: Combine 1 part VC with 4 parts potting media.
- **Transplants small containers**: add ½ cup to hole prior to planting; larger plants, shrubs, trees: 1-2 cups prior to planting.
- **Lawn and turf established**: 7 lb/100 sq ft; **new**: 10 lb/100 sq ft.
Leachate is NOT Vermicompost Tea!

- Tea is NOT dark liquid leaking from worm bin
- May contain pathogens, byproducts of anaerobic decomposition (sulfides, acids), high salt content from mineral nutrients, inherent salt contents of parent material
- Do not use on food crops! Not recommended for houseplants or sensitive plants

Vermicompost Tea

- Two primary approaches to VC tea production
  - Aerated Compost Teas (ACT): 24 - 48 hours
  - Non-aerated Compost Teas (NCT): 5 - 14 days
- Both methods: steep compost in potable water for defined period at room temperature
- Use promptly; oxygen gets used up and microbes die
- Do not add simple sugars as they can promote growth of E. coli or Salmonella

Educational Resources

- Worms Can Recycle Your Garbage
- Raising Earthworms Successfully
- 4-H Vermicomposting Curriculum
- Videos and podcasts
  - https://composting.ces.ncsu.edu

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