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…

Turnips Grown With 0%, 10%, 20% Vermicompost

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

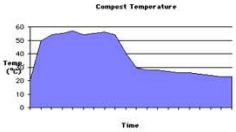
Vermicomposting

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

These are two separate methods that should not be combined!

Composting

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



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

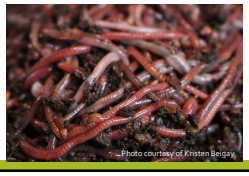
Anecic
Live in soil (vertical burrows)
Eat soil & litter

Endogeic
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

Worm Grower
$35 - $50/lb

Bait Shop
$122/lb
(36 cups @$3.38 each)

Eisenia fetida Needs

Temperature: 60–80F (tolerate 32–95F)

Ammonia & Salt sensitive

Oxygen

Moisture: 80% (tolerate 60-90%)

pH: 7.0 (tolerate >5 - <9)

E. 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

Do not drill holes in lid!

- **Air:** around ***upper*** sides of bin
- Rhonda's Fave — Lots of tiny holes all the way around
- **Drainage:** six holes on bottom (1/4-inch)

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*

THIS!

NOT THIS!

Collecting Food Scraps

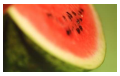
Freezer

Reuse a container

Buy a container

Kitchen Scraps for Worm Bin

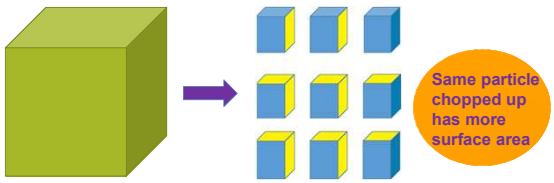
- Vegetables
- Fruit
- Coffee grounds
- Tea leaves
- Bread
- Pasta



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

<u>Particle Size</u> Affects Decomposition Rate



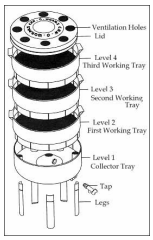
Healthy Worm Bin Traits

- 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

Harvesting Vermicompost
Method #2: Sideways Separation

Harvesting Vermicompost
Method #3: Vertical Separation



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

(January 29, 2021)

- Vermicompost effects on plant **growth**: 32,700
- Vermicompost suppress plant **disease**: 7,000
- Vermicompost suppress plant **pests**: 8,280
- Vermicompost suppress plant **parasitic nematodes**: 2,440

Mix Vermicompost into Soil

- Gardens
- Lawns
- Trees
- Nurseries
- Farms
- Vineyards
- Golf courses
- Turf
- Houseplants

Adding Vermicompost to Soil

10% by Volume	20% by Volume
½-inch VC to 4.5-inches soil	1-inch VC to 4-inches of soil
1-inch VC to 9-inches soil	2-inches VC to 8-inches soil

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!**

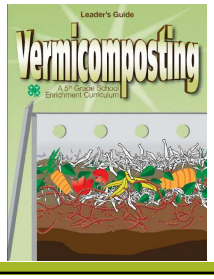
Images: Solana Center

- 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

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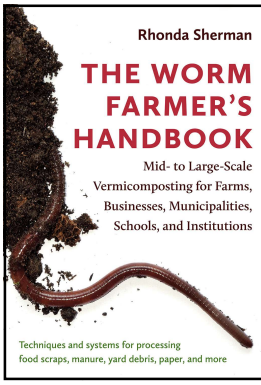

- Vermicomposting operations around the world
- Vermicast benefits to soils, plants
- Choosing a production system
- Finding and managing feedstocks
- Monitoring an active worm bed
- Vermicast: harvesting, screening, testing, packaging, storing
- Markets for earthworms and vermicast
- Keys to success: avoiding common pitfalls
- Business and marketing plans

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