



# Vermiculture



THE UNIVERSITY  
OF ARIZONA

# Vermiculture vs. Vermicomposting?

Vermiculture is the **culture** of earthworms. The goal is to continually increase the number of worms in order to obtain a sustainable harvest.

Vermicomposting is the process by which worms are used to convert organic materials (usually wastes) into a humus-like material known as vermicompost.



# The Value of Vermiculture

- **Earthworms provide a natural method for recycling organic material**
  - **Food prep leftovers**
  - **Scrap paper**
  - **Garden crop remains**
  - **Yard trimmings**
- **Earthworm castings:**
  - **Are an eco-friendly fertilizer**
  - **Stimulate the natural activity of beneficial soil microorganisms**
  - **Promote the activity of enzymes and natural plant growth regulators**
  - **Regulate the availability of essential plant nutrients**



# University of Georgia Engineering Outreach Program



**"Plants Grown In Worm Castings Grew 3 Times  
Faster Than Identical Plants Grown In Potting Mix"**



# NC State Extension



**Small turnip – no vermicompost**  
**Medium turnip – 10% by volume**  
**Large turnip – 20% by volume**



# Are All Worms Equal?

- Over 9,000 different species of earthworms
- Only the group of earthworms identified as epigeic are suitable for vermiculture
- Epigeic earthworms
  - Live in topsoil
  - Deposit castings on the surface
  - Don't burrow deep in the ground
- The most commonly used is the *Eisenia fetida* aka 'red wiggler'
- Fetida means foul-smelling



# Environment

- **Moisture content should be 60-85% with 80% being perfect**
- **Ideal temperature is about 70 degrees but worms will tolerate a range of 40-90 degrees**
- **A good worm bin should be maintained at a pH of 7.0**



# Worm Bedding

- **Shredded Paper**
- **Shredded Corrugated Cardboard**
- **Coir**
- **Wood Shavings**
- **Dry Dead Leaves**
- **Hay or Straw**
- **Commercial bedding**

**Things to remember:**

**Aeration**

**Continuous moisture content**

**Up to 50% may be used as food**



# My Favorite Bedding



**Coir Brick**



**Shredded Coir**



# My Favorite Bedding



**Shredded Coir mixed with Paper Shreds**



# What Worms Eat

- **Vegetables**
- **Fruit**
- **Coffee grounds**
- **Tea**
- **Bread**
- **Leaves**
- **Yard waste**
- **Egg shells**
- **Paper**
- **Pasta**



# A Feeding Example



**Banana Peel**  
**Egg Shells**

**Rotting coleslaw**  
**Kale leaves**

**What's Missing?**



# Don't Feed



- **Meat**
- **Dairy**
- **Citrus**
- **Sauces**
- **Oils**
- **Foods with preservatives**
- **Spicy foods**
- **Pet wastes (dog and cat)**



# Food Prep

**Smaller is better**

**Grind, puree, shred,**

**Freeze, Precook food**



# It Takes Two!

- Red worms have both males and female characteristics
- Line their bands up releasing a mucus film that covers both



- They wriggle out of their band which creates a cocoon
- The cocoon has a hard shell to protect eggs/developing babies



# It Takes Two!

- The size of a grain of rice, it starts out white, then darkens turning yellow, then brown and when it turns reddish worms are ready to hatch
- Can take from 3 weeks to a year. Typically hatch in warmer weather
- Cocoon may have as many as 10 eggs but only 2-6 worms will emerge
- In 2-3 months they are ready to start reproducing



# These Aren't Baby Red Wigglers!



**Actually they are POTWORMS**  
**Indicate potential problems in your worm box**



# About Potworms

## Potential issues indicated by potworms:

- Too acidic
- Too wet
- Overfeeding
- Too much starch



## Remedies:

- Add carbon, cardboard, paper, soak up moisture
- Cut back on fruit and vegetable scraps
- Remove fermenting excess food
- Aerate Soil
- Add crushed egg shells to neutralize the pH (acidity)



# Habitats

- **DIY worm boxes**
- **Purchased worm boxes**
- **Worm towers**



# DIY Worm Box



## Components:

- 3-4 Plastic tubs or buckets (1 lid)
- 4 small plastic containers



# Drill Holes in 2-3 Tubs



# Small Containers Create Area for Leachate



# Disaster Waiting to Happen



# Purchased Worm Boxes



# Worm Towers



Courtesy of Permaculture News



# Worm Byproducts

- **Worm Castings**
- **Worm Bin Leachate**
- **Worm Tea**



# Separating Worms from Castings



**Tarp Method**



**Vertical Method**



**Horizontal Method**



# Worm Castings

Worm castings can be used as:

- a soil additive
- a soilless mix
- a tea / slurry



# Worm Castings as an Additive

- **When planting new plants – simply put a handful in the planting hole.**
- **When you are propagating seeds, mix them with coir as a seed raising mix, 2 parts coir to 1 part worm castings**
- **As a general soil conditioner by digging them in through the soil.**
- **Before you mulch, spread them thinly and then mulch over the top.**
- **For container grown plants, 25 % worm castings to 75% potting soil**



# Worm Castings Soilless Mix

- **40 % Castings**
- **30% Perlite**
- **30% Vermiculite**



# Worm Tea

**Natural fertilizer made from worm castings, water and a sugar**

**To make the tea:**

- **Dechlorinate 10 gallons of water**
- **Put 1 pound of worm castings in a mesh bag, panty hose, etc**
- **Drop the castings bag into a 5 gallon bucket and cover with  $\frac{1}{2}$  the water.**
- **Add 1 Tablespoon of molasses, honey or other sugar**
- **Sink an aquarium bubbler in the water and let it run for 24 – 48 hours**
- **Remove the bubbler and the castings**
- **Mix with remaining water**



# Worm Bin Leachate

- **Liquid that drains out of a worm bin**
- **May carry a bad mixture of microorganisms**
- **Must be diluted (10 parts water to 1 part leachate)**
- **Only use fresh leachate**
- **Better to aerate if planning to regularly use**



# Practice Benign Neglect

- **Don't overfeed**
- **Remember to keep adding bedding**
- **Keep worm bedding moist**
- **Don't freeze your worms**
- **Be sensitive to big changes in the worm box**



# Great Resources

## **NC State Extension:**

<https://composting.ces.ncsu.edu/vermicomposting-2/>

## **Worm Tower:**

<https://www.permaculturenews.org/2016/02/02/how-to-build-a-worm-tower/>

## **Composting Tea:**

<https://www.redwormcomposting.com/worm-tea/making-vermicompost-tea/>



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