COMPOST
KEY TO GARDEN SUCCESS

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WHAT IS COMPOST?

- Compost is a soil amendment. It is a nutrient-rich, dark, crumbly material that helps improve soil health and provides essential nutrients to plants. Compost is the result of the natural decomposition process that turns the nutrients from once-living materials into a rich, organic component of soil, humus (HYOU-mus). Humus is created during the production of compost.
- Composting is the recycling of organic materials or a method of solid waste management whereby the ***organic components*** of the solid waste stream is ***biologically decomposed under controlled conditions*** to produce a ***valuable end product*** (Goldstein, ed., *Biocycle Guide to the Art & Science of Composting*, p.14).
- Properly prepared compost is not necessarily a rich source of nutrients for soil, but because the high surface area and chemical makeup of humus allows it to absorb and retain soil nutrients and moisture, compost is an excellent soil conditioner. (Dr. Robert Humphreys)

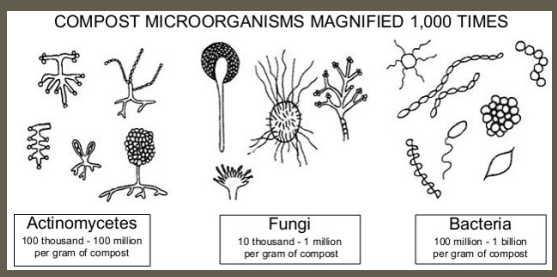
WHY COMPOST?

BENEFITS OF COMPOSTING

Environmental
Self Reliance
Easy?

- 2/3 of municipal waste stream is organic waste
- Build organic matter and nutrients "on the farm"
- 1 yd3 of compost = $30-40 more if delivery is needed
- 1 ft3 of compost = $5 at big box store

COMPOST ECOSYSTEM



COMPOST ECOSYSTEM

Bacteria
Actinomycetes
Fungal Hyphae

Protozoa
Nematodes

Organisms contained in 1 teaspoon of compost

- Up to 100 million Bacteria
- 400-900 ft of fungal hyphae
- 10,000-50,000 protozoa
- 30-300 nematodes

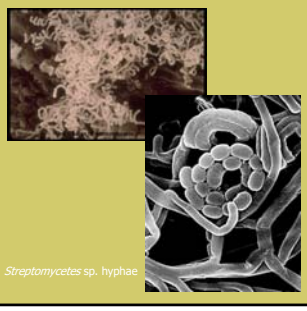
BACTERIA

Nitrobacter winogradskyi

- Smallest living organisms, Single Cell
- about 80-90% of the biology of compost
- Engine of the pile-Responsible for the heating
- Bacteria live and move in water films
- Classified by temperature ranges they grow
  - Psycrophiles <39 F
  - Mesophiles 68 – 104 F
  - Thermophiles optimum 122 F

*Listeria grows and survives in refridgeration <40 F

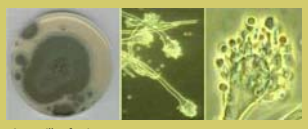
ACTINOMYCETES



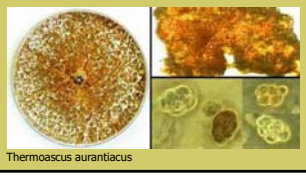
Streptomycetes sp. hyphae

- Really a kind of bacteria
- Looks and acts like a fungus
- Streptomycetes spp. Dominant in compost, fresh earthy smell comes from these guys
- Bind aggregates in pile through fungal like gray growths
- Prefer moist conditions, Neutral pH, O2,
- Live at lower temperatures (Mesophiles)

FUNGI



Aspergillus fumigatus



Thermoascus aurantiacus

- Single and multi-celled organisms
- Produce fruiting bodies and spores
- Perform more complex decomposition roles such as the breakdown of cellulose
- Need O_2
- Fungi binds free particulates together improving overall soil structure
- Most are mesophiles

TEMPERATURE STAGES OF COMPOSTING

Mesophilic

- < 104 F
- Will follow a Thermophilic stage unless, optimum conditions were not present
- Fungi take over and break down lignin and cellulose

Thermophilic

- 104 – 158 F Killing stage for various pathogens and weed seeds
- Commercial compost must maintain 150 F for 15 days
- Dependent on proper moisture, aeration, and C/N ratio
- 113 – 130 F maximum degradation rates
- 149 F and above – only thermophiles survive

Curing

COMPOST: BALANCING INPUTS TO MAXIMIZE EFFICIENCY OF MICROSCOPIC LABOR FORCE

- Carbon to Nitrogen Ration: Target is 30:1 25-40 acceptable
- Moisture Content: Range 45-60%
- Particle Size: Smaller the better=Increased surface area
- Temperatures of 130+ for 3-15 days will kill *MOST* pathogens and weed seeds

COMMON INGREDIENT NUMBERS

Ingredient	C:N Ratio	Moisture Content
Wood Chips	400-700	
Sawdust	100-400	
Newspaper	170	
Wheat Straw	128	
Straw	80	
Leaves	40-80	
Fruit Scraps	35	
Horse Manure	25	
Coffee Grounds	20	
Fresh Grass Clippings	17	
Poultry Litter	15	
Vegetable Scrap	12	

Many online calculators available. Good rule of thumb 2/3 Browns to 1/3 Green

COMPOST PROBLEM TRIAGE

PROBLEM	CAUSE-SOLUTION
• Smells Bad	• C:N ratio too low, Anaerobic Conditions: Add C, Aerate
• Compost Not Breaking Down	• Moisture too low, C:N ratio too high: Add Water, Add N
• It Stays Soggy or Wet	• Too much Rain, too many leaves: Aerate, shred leaves prior to composting
• Volunteer plants or weeds come up	• No Thermophilic Stage: avoid adding seeded material, manage pile to maintain heat

COMMERCIAL COMPOSTING

Windrow Method

Athens Municipal Dump

WINDROW TURNING

BACKYARD/HOME COMPOSTING

- What are your goals
- How much Browns & Greens do you have
- What will the neighbors think
- How much time/effort do you have
- How much do you want to spend
- What tools do you have, i.e. bagging mower

MY HOME SET UP

- Tumbler for quick, Thermophilic composting 3-7 days
- Mesh Bin for Mesophilic and curing 2-6 weeks

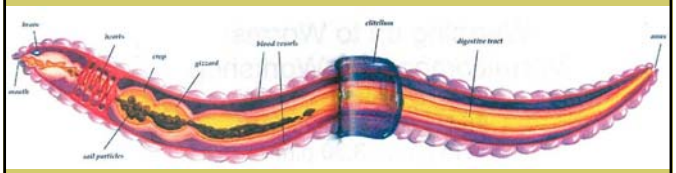
INGREDIENTS

THERMOPHILIC STAGE

VERMICOMPOSTING – WORM COMPOSTING

- Easy, low maintenance
- Excellent for average family that just has food scraps
- Fun for kids
- Can be done indoors, in apartments, classrooms
- Excellent compost

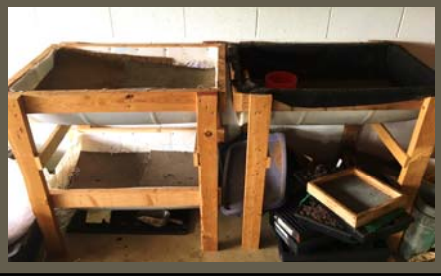
WORM BIOLOGY



RED WIGGLERS *EISENIA FETIDA*

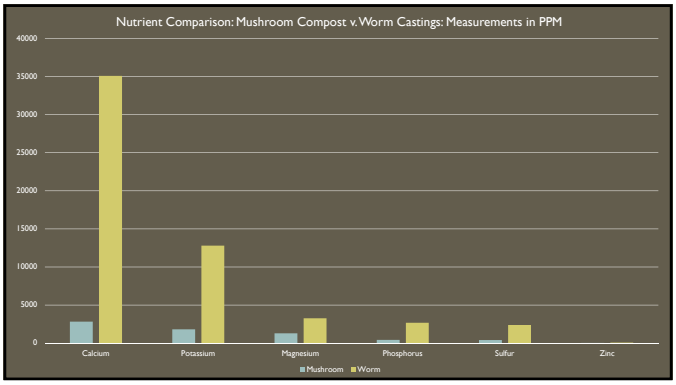
- Top Feeding worms
- Eat about ½ body weight per day
- Double population about every 3 months
- 1 lb of worms = 1,000 worms
- Live up to 2 years
- Lay one cacoon or egg sac per week, each cacoon produces 3 or 4 worms
- Begin breeding 4-6 weeks of age

MY HOME SETUP



WORM CASTING GROWTH RESULTS TURNIPS: 0%, 10%, 20%

WORM CASTING GROWTH RESULTS CARROTS: 0%, 10%, 20%



NUTRIENT COMPARISON

MUSHROOM	
Calcium	2819
Potassium	1807
Magnesium	1284
Phosphorus	429
Sulfur	407
Zinc	34.99
% Nitrogen	.5
% Phosphorus	.1
% Potassium	.218

WORM	
Calcium	35082
Potassium	12800
Magnesium	3269
Phosphorus	2678
Sulfur	2375
Zinc	62.3
% Nitrogen	1.8
% Phosphorus	.614
% Potassium	1.542

VERMICOMPOST & DISEASE SUPPRESSION

Cornell Waste Management Institute.