Compost

Compost Tea Workshop

Rutgers University

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What is Compost ?

- Aerobic Process (So the good guys grow)
- Decomposition
  - Requires BACTERIA and FUNGI in high diversity
  - Why High Diversity?
  - So decomposition will continue through all environmental conditions
  - Freezing to burning, wet to dry, When salts are unbalanced
- A Mix of Organic materials
  - High diversity requires lots of different foods to grow the organisms
- NUTRIENT CYCLING requires predators

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Compost is “BLACK GOLD”

- Microbial life in soil is key to healthy turf and gardens
- Compost is the best source of OM and beneficial micro-organisms
- Om is the major energy source for plant life
- Millions of Beneficial's per handful
- Compost nurtures the development of the soil system
- Needs to be mature Compost

4 Phases of Composting

- Mesophilic
- Thermophilic above 115 degrees
- Second Mesophilic
- Maturation

- Heat and Microbes change in each phase
- Need to reach 137 degrees for 72 hours to
- Kill weed seeds and pathogens

Immature Compost

- Wants to finish
- Pulls N from the soil
- Damages turf
- Turf Yellows
- Chlorophyll decreases
- Photosynthesis reduced
- Carbohydrate production drops
- Turf weakens

Rate of Application Turf

- ¾ to 1 cubic yard per thousand Square Feet
- ¼ to 3/8 inch depth for turf – no more
- ½ inch too thick for topdressing
- Topdressing Equipment – discussed later

The Composting Process

- Get the balances of starting materials and organisms correct
  - High N green woody, High C leaves, wood chips, card board, newspaper
  - 5 parts brown to one part green
- Keep it aerobic; Pathogens prefer anaerobic
- Control decomposition Process
- Temperature 131 degrees or higher for 15 days
- Water must be Chlorine and Chloramine free
- Turning Pitchfork, worms, not necessary with Static system
- Monitoring temperature in the pile
- Adjustments

Household Composting

- Four Foot High Hardware cloth
- 50% Green to 50% woody
- Add household waste at least 2 feet into pile
- Add 10% high nitrogen
- Start Compost temperature cycle, monitor temperature, moisture

Vermi - Composting

- Cold Composting method
- Layer organic matter onto top of worm bed
- Worms consume OM, make castings, shift upward into new food
- Harvest worms from bottom of table
- Worms consume bacteria, fungi, and protozoa, nematodes growing on foods added to the surface
- Worms turn the compost, kill pathogens, passing through digestive system, or contact on worm surface
- Low rates of composting in cold, increases with temp.,but shut down between 85 to 90 degrees
- 60 to 70 % moisture optimal
- See Appelhof, “Worms Eat my Garbage”
  - mappelho@tsdnet.com

Static Composting

- Utilizes A timer and fans that can push or pull air through the pile
- Aeration frequency between three to four on cycles per hour
- Duration of air between 2 and 7.5 minutes per cycle
- Aeration speeds up process, maintains temperature and moisture
- Avoids odor
- Keeps away animals
- Curing 45 to 60 days
- Produces a superior product

Why no Human Pathogens in properly made compost?

- Heat (kills bacteria, Fungi and viruses)
- Microbial competition for food and space
- Human pathogens don't survive high temperatures, but the bneficials have resistant stages. As long as temperature does not get too hot too fast, the good guy survive
- Temps:131F for 3 days; 150F for 2days;165Ffor 24 hrs, but not higher, because of use oxygen

C:N Ratios of Common Materials

Description	C:N Ratio
Poultry Manure	15
Cow Manure	18
Horse Manure	25
Grass Clippings	12-15
Fresh Leaves	40
Wheat Straw	130-150
Mixed Paper	230
Saw dust wood shavings	200-500

C:N Ratios

- Proper Range 30:1 can be achieved by adjusting feedstock materials
- Foe example:
- Grass clippings mixed with fresh leaves can yield a 30:1 ratio
- Poultry or cow manure mixed with wood shavings
- Horse manure by itself is ideal for composting, but mixed with straw sawdust or wood shavings ratio would be too high
- Because CO2 is created as a by product of the composting process, the amount of carbon in the compost decreases. Ex. Horse manure with no bedding may start out with a C:N ratio of 25:1 and the compost may end up with a C:N ratio of 20:1 or less

Compost Top Dressers

- Eco-Lawn Applicator ECO200 (Dual Spinner) price $50995.00
- Pull behind tractor mount
- Wheelbarrows / Spring rakes
- ¼ to 3/8 inch ideal, ½ inch too thick

Compost Tea

- It will be one of the foundations of a complete Organic program
- Compost – addresses OM and soil biology
- Compost Tea addresses soil biology
- Products that address soil biology
  - Compost Tea
  - Mycorrhizal Fungi
  - Microbial inoculants
  - Seaweed
  - Humates

Facts

- Source of Soil and foliar Nutrients
- Competes with disease causing organisms
- Produce essential plant growth hormones
- Fix N
- Mineralize plant available nutrients

Benefits of Tea

- Create biologically active soils
- Health and quality of turf/plants are improved
- Increased ability to retain N, P, K, Ca

- Improve soil structure
- Water and nutrient retention
- Oxygen diffusion
- Disease suppression

Mycorrhizal Inoculants

- Inoculates soil
- Mycorrhizae colonize roots of plants
- Assist in nutrient transfer
- Increase plants ability to get nutrients

Fungi : Bacteria Ratio

- Compost tea a liquid extract of high quality compost
- ¾:1 Ratio is ideal Fungal to bacteria Ratio for turf
- Tree and plants like a fungal dominated tea
- Turf likes about an even F:B

- Rate 15-25 gallons per acre
- “Certification” issue
- Testing with a microscope
- Microscope I use: 40x – 2000x Trinocular Compound Microscope – Model #M8311
- Bio-assay

Brewing

- Start with Aerobic Compost-organisms are important
- Worm castings fresh – properly vented open bags never stack tubs
- Water Chlorine, smell, containers clean?
- Brewer: Compost bag, Pump, Aeration
- Ease of cleaning, Ease of transferring
- Foods? When added
- Organism additions
- Spray tanks, ease of cleaning? Nozzle size? Pump/ tubing?

250 GEO Tea Brewer

The process

- APPLICATION
- Need to cover surfaces with bacteria and fungi so disease can not get to foliage, or roots
- How often, how much food to feed organisms once sprayed
- Bacteria and Fungi will cover leaf surface and be visible under magnification (400x)

Application method

- Sprayers, drip, helicopter, planes
- Nozzle sizes – match compost bag mesh with nozzle opening
- Low pressure High Volume spraying
- Boominator – flood jet nozzle 25-30 ft. span and Solenoid Valve control
- Flooding nozzle for JD-9C spray gun


BOOMINATOR
MADE IN U.S.A.

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Application Timing

- Time of Day - Not as important if droplet size is greater than 1 mm.
- Prefer early morning or evening –
- Do not spray in high heat/ midday
- Like overcast days
- Ideal when it as rained evening before and foliage is still wet
- I like spraying in a light misty rain
- Prefer to irrigate tea on completion of application
- Chlorine dissipates as water is dispersed from system

Water Source on Application Site

- Personally never cut the tea any less than 50%
- Water Source same considerations as brewing/ Humic Acid Powder –one Tablespoon per 50 gal water

The process - Cleaning

- Cleaning The Machine / Sprayers / Holding Tanks / Hose /Guns
- Food grade cleaning
- Simple green / Bleach / Hydrogen Peroxide cleaners

- ELIMINATE THE BIO-FILMS
- Hidden surfaces are bad news
- Look inside the machine before You buy it – ease of cleaning
- Sharp corners no good
- Clear hoses

The Process - Temperature

- Temperature Water or Air
- Effects- slower growth when colder(longer lag period)
- Faster growth when warmer
- Use foods faster when temperature is higher
- Use foods less when cooler
- Use up Oxygen faster in higher temps
- No problem using up oxygen when cool

The Process - Select a good machine

- Aeration – Can machine keep brew aerobic in higher temperatures?
- Extraction – Water movement through compost which will rip organisms from surfaces into the water
- Ask to see Data on organisms the machine can extract and grow

The Process

- AEROBIC Brewing Process
- Maximum amount of foods to feed desired organisms
- Without driving brew anaerobic
- Ask to see Data on recipe to use

Factors involved in making good CT

- Compost (Inoculum, Nutrients)
- Aeration, Extraction (Machine)
- Temperature
- Foods
- Water - Pond, Stream, Rain, Well finally de-chlorinated tap
- CLEANING
- Timing
- Sprayer
- Application Factors (Soil, Foliar)

Organisms that can be added to Compost or Tea

Fungi:

- Beauvaria
- Trichoderma
- Mycorrhizal fungi

Bacteria:

- Pseudomonads
- Bacillus
- Azotobacter, Rhizobium

Nematodes Steinernema,Heterorhabaditis

Checking the Tea

- A Microscope 100x-400x-1000x
- Checking during brewing process
- Checking in sprayer
- Checking out of gun
- Is it alive as it is being sprayed?
- Is it alive after 4 hour?
- Is it alive after 8 hour?

Compost tea Recipes

- Basic Compost Tea Recipe (all recipes are for 5 gallons)
- 2 cups of balanced compost(equal parts bacterial-to fungal biomass)
- 2 tbsp. of kelp
- 1-1.5 tbsp. Organic unsulphered blackstrap molasses 1 tbsp., Humic acid

Fungal-Dominant compost tea recipe 5 gal

- 2-3 cups of fungal dominant compost
- 2 tbsp. humic acid
- 2 tbsp. liquid kelp
- 2 teaspoons of yucca extract*

- * Add Yucca near the end to prevent foaming

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Ultimate Compost Tea Recipe 5 gal

- ¼ cup earth worm castings
- ¼ cup fungal dominant compost
- ¼ cup forest soil
- 3 tbsp. soluble kelp
- 2 tbsp. rock dust powder
- 2 tbsp. humic acid
- 2 tbsp. liquid fish hydrolysate
- 1 tbsp. of soluble organic un-sulphered black strap molasses

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Compost Tea Recipe's

- 12 gallon – 4..5 cups compost
- ¼ cup alfalfa meal
- 2 cups microbe catalyst – alfalfa meal, feather meal, steamed bone meal, calcium carbonate, humic acid, kelp meal

- 55 gallon – 2 gallon compost
- 4 cups microbe catalyst
- 1 cup alfalfa meal
- 4.5 cups microbe catalyst

Compost Tea Recipe's

- 100 gallon – 6 cups microbe catalyst
- 2 cup alfalfa meal
- 3 gal compost

- 220 gallon – 8 cups microbe catalyst
- 2 cups alfalfa meal
- 3.5 gallon compost

Lincoln Landscape Recipe

- 220 gallon
- 1 gallon fungal dominant compost ($400 per yard)
- 1 gallon static compost
- 1 gallon worm castings (Todd Harrington)
- ½ gallon organic rabbit manure/ organic hay (for protozoa)
- 16oz. Humic acid/ 12 oz. alfalfa
- 12 oz. seaweed/ 12 oz. fish hydrolysate
- 8oz. Azomite/ 8 oz. molasses
- 8oz.= 1 cup

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Basic Compost Tea Recipe

- Dr. Elaine Ingham
- 25 gallons water no chlorine
- 1-2 tbsp. humic acid
- ½ cup kelp pre mixed in 5 cups of water
- 5 pounds of good compost
- 1 cup steel cut oats

Compost Extracts

- Place the compost in the compost sock 1 LB per gal of water
- Massage bag for one minute
- Check tea (microscope)
- Repeat if not enough organisms
- Apply
- If you are not sure of quality add foods – humic acid, fish hydrolysate, or steel cut oats to the compost 3 to 7 days before extracting

Overview - Our Goal

- Our Goal is to reduce inputs over time
- Sustainability
- Nutrient Cycling – the movement and exchange of organic and inorganic matter back into the production of living matter. The process is regulated by food pathways that decompose matter into mineral nutrients

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TORO
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Lincoln Landscaping References

- Osborne Organics 781-631-2468 www.osborneorganics.com
- Jeff Frank – Green Guerilla's - West Hampton NY
- Steve Storch 631-726-6783 www.naturalscienceorganics.com
- Dr. Elaine Ingham www.soilfoodweb.com
- Peter Moon O2 Compost 360-568-8085 www.O2compost.com
- Peter Schmidt 914-909-0249 w.compostwerks.com
- Barry Draycott 609-468-1905 www.techterraenvironmental.com
- Rodale Kutztown PA.

Reading List

- “The Soil and Health” – Sir Albert Howard
- “The Findhorn Garden”– The Findhorn Community
- “Secrets of the Soil” – Peter Tomkins Christopher Bird
- “The Secret Life Of Plants” – Peter Tomkins, C. Bird
- “Summer With The Leprechauns” – Tanis Helliwell
- “Enlivened Rock Dust Powders” – Harvey Lisle
- “Diet For A New America” – John Robbins
- Greening America To Save The World” – Mark Pavatich

More Reads

- “The Man Who Planted Trees” – Jean Giono
- “Let’s Get Growing” – Crow Miller
- “Weeds-Control Without Poison” – Charles Walters Jr
- “An Acres U.S.A. Primer” – Crow Miller
- “The Little Green Book” – Jeff Frank
- “Fletcher Sim’s Compost – Charles Walters
- “DNA: Pirates OF The Sacred Spiral” – Dr. Horowitz
- “Raising With The Moon” – Jack R. Pyle & Taylor Reese

And more reads

- “Hands On Agronomy” – Neil Kinsey
- “The Dying Of The Trees” – Charles Little
- “The Handbook of successful Ecological Lawn Care” – Paul Sachs
- “The Lorax” – Dr. Seuss
- “Managing Healthy Sports Fields” Paul Sachs

Supplementary Reading

- “Ishmael” Daniel Quinn
- “Mid Course Correction” Ray Anderson
- “Growing Wild” – Karen Blumer
- “Deadly Feasts”- Richard Rhodes
- “Green Psychology” – Ralph Metzger
- “Anastasia” – Vladimir Merge
- ‘Easy Compost” – Brooklyn Botanical Garden
- “Noah’s Garden” – Sara Stein
- “The Albrecht Papers” – William Albrecht

Supplementary Reading

- “Slim Spurling Universe” – Cal Harrison
- “The Last Hours of The Ancient Sun” – Thom Hartman
- Native Species Planting Guide For N.Y.C. & Vicinity –
- “Messages From Water” – Masuro Emoto
- “Cradle To Cradle” – Wm. McDonough and Mike Brungart
- “Beak Of The Finch” by Jonathan Weinerby
- “The Ambassadors “ – Jeff Franko
- “Thee Ringing Cedars Series”