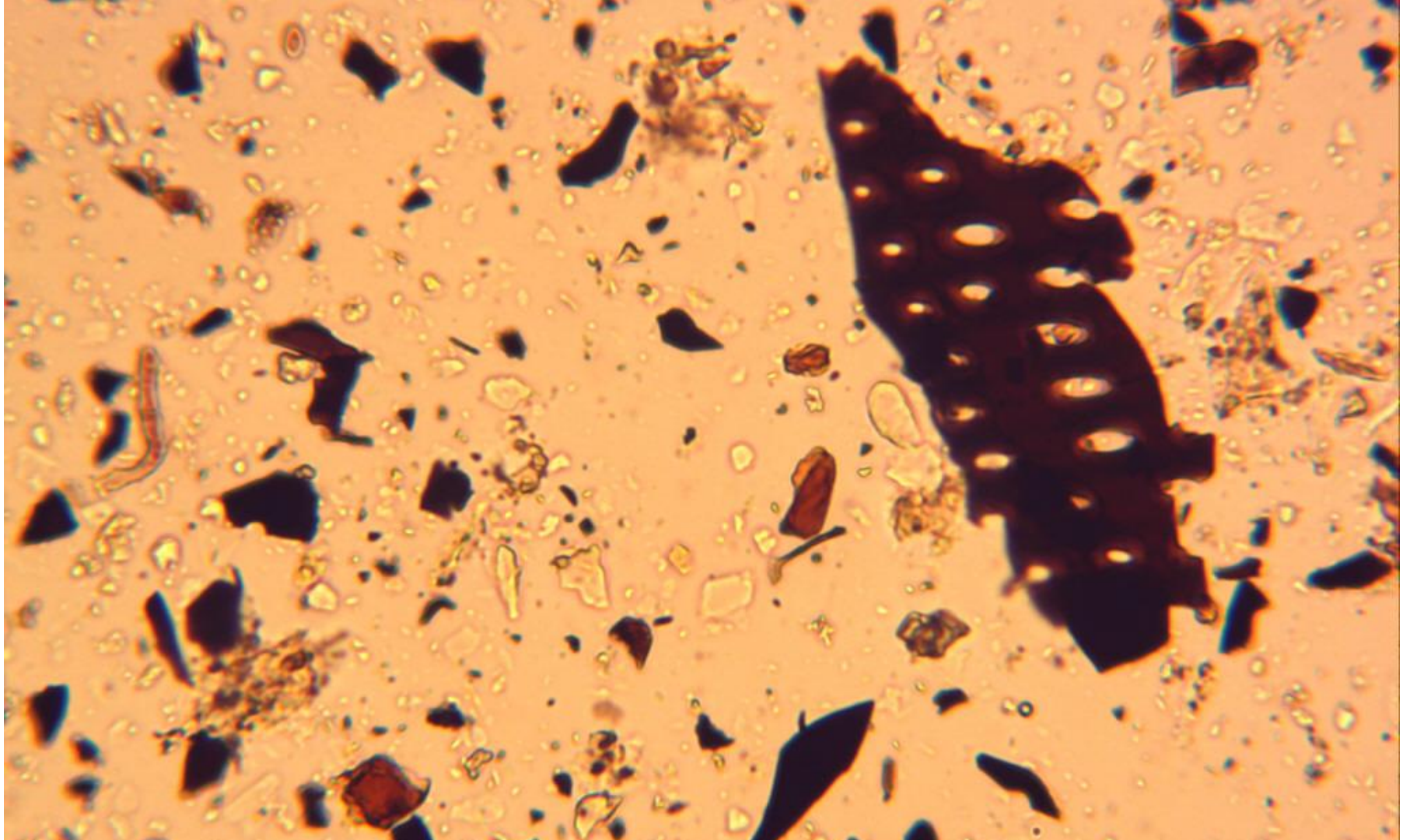
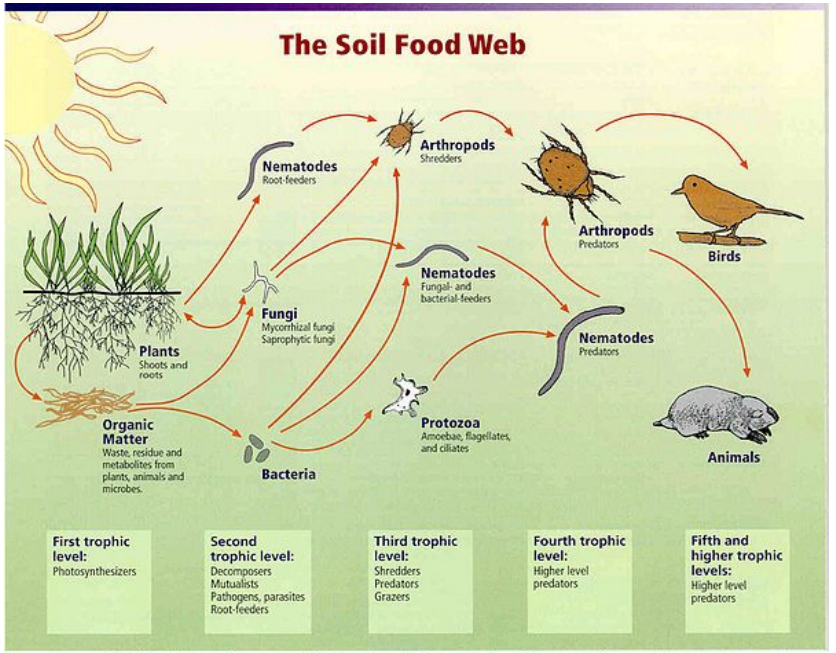
Charging and Inoculating Biochar

Dan Hettinger
Living Web Farms Biochar



Remembering the Soil Food Web

- Emphasizes complex relationships of give and take among organisms in soil.
- Diversity among organisms creates resilience, improves soil structure and nutrient exchange.
- Biochar aids diversity by moderating stressful conditions and creating a stable habitat for microbes
- Adding ‘uncharged’ biochar can be a disruptor by tying up nutrients.
- Better to load biochar with nutrients and entice microbes to move in



Relationships between soil food web, plants, organic matter, and birds and mammals
Image courtesy of USDA Natural Resources Conservation Service
http://soils.usda.gov/sqi/soil_quality/soil_biology/soil_food_web.html.

Charging and Inoculating… what does it mean

- Process of charging (adding nutrients) and Inoculating (adding microbes) to biochar
- Remember the adsorptive qualities of biochar will ‘suck in’ nutrients in your soil when applied raw
- Important to understand that nature will take it’s course… if you have the patience to wait (1-2 growing seasons?), then you can skip this step.
- Charging and Inoculation allow you to hit the ground running on crop production, jump-start the soil food web, restore damaged soils.
- Biochar can be a substrate for custom blends of microbes and microbial foods catered towards specific plant needs (“designer chars”)
- When conditioning biochars, think in terms of **Nutrients, Microbes and Substrates**

Mix with finished compost

- Nutrient charging and microbe inoculation in one shot
- Mix char and compost at ratio as high as 1:1 (50/50)
- Maintain moisture *after mixing in char* - squeeze test
- Compost markets are dominated by inferior compost, quality fungal compost has been very difficult to find.
- Be prepared to wait at least a few weeks - assuming moisture conditions are right and compost is high quality

Liquid Gold

- 10:1:4, plus some trace elements
- Store for a 30 days above 68 degrees for sterilization. **Science is still out on this.**
- Dilute 1:5-10 for direct application to soil. No need to dilute for charging biochar
- Beware salt accumulation.
- Beware pharmaceuticals.
- Great way to provide nutrients to microbes, convince microbes to “move in”
- Wetting and charging in one step, NOT a microbial inoculation
- Probably best done before composting, adding microbes. **Guarantee safety with PFRP**

Source: waldeneffect.org

Actively Aerated Compost Tea

- Microbial extraction... and multiplication
- Ingredients: Good compost, Microbial foods, and AIR
- Custom brews for specific applications:
  - Bacterial tea
  - Fungal tea
  - Foliar application
  - Soil drench
  - Compost enhancer/accelerator
  - Biochar inoculation: important to provide adequate nutrients
- Lots of recipes available
- Simply put:
  - with appropriate air, worst case is your tea isn't doing anything
  - Without air, possible multiplication of pathogens
- If tea is brewed well, all microbial foods will have been consumed.

Image source: motherearthnews.com

Vermicompost

- Great way to use food waste at home, very scalable
- Start with a container or two of ‘red wigglers’
- 2 lbs of worms - 1 lb/day of food waste
- Opaque container, 8-12” deep
- Moisture management is critical
- Moderate temperatures req’d. 40-80. 55-77 preferred
- Bedding, grit, worms, food, cover
- Multiple ways to harvest castings

Mix AS compost

- Speeds up composting
- Acts as a ‘black’ carbon source, with your ‘browns’ and ‘greens’
- Found to reduce losses of nitrogen (up to 50% - UGA, 42 days w/20%biochar)
- Improves texture, uniformity
- Great way to further process pee-char
- James Joyce C:N Ratios: slow pyrolysis biochar 100:1, too inert to compost without traditional high organic carbon sources.
- Example: Aiming for 25-35:1 C:N ratio.
    - 10 parts grass clippings, (15:1)
    - 5 parts shredded leaves, (55:1)
    - 1 part slow-pyrolysis biochar (100:1)
- Think seasonally for at-home inoculation: alternate between methods if necessary...if you’re like me, you won’t have enough material to compost until harvest, leaf drop

References and Resources

- **Why we process and condition biochar for use in the soil:** www.dyarrow.org/CarbonSmartFarming/docs/**BiocharUse**In**Soil**.**pdf**
- **Composting with Biochar:** www.terra-char.com/uploads/2/3/7/9/.../composting_with_**biochar**.**pdf**
- **Composting Tea Brewing Manual:** http://www.nofanj.org/literatureretrieve.aspx?ID=104151
- **Small scale vermicomposting:** https://www.ctahr.hawaii.edu/oc/freepubs/pdf/**HG**-**45**.pdf
- **Great reference for vermicomposting**: http://oacc.info/DOCs/Vermiculture_FarmersManual_gm.pdf.