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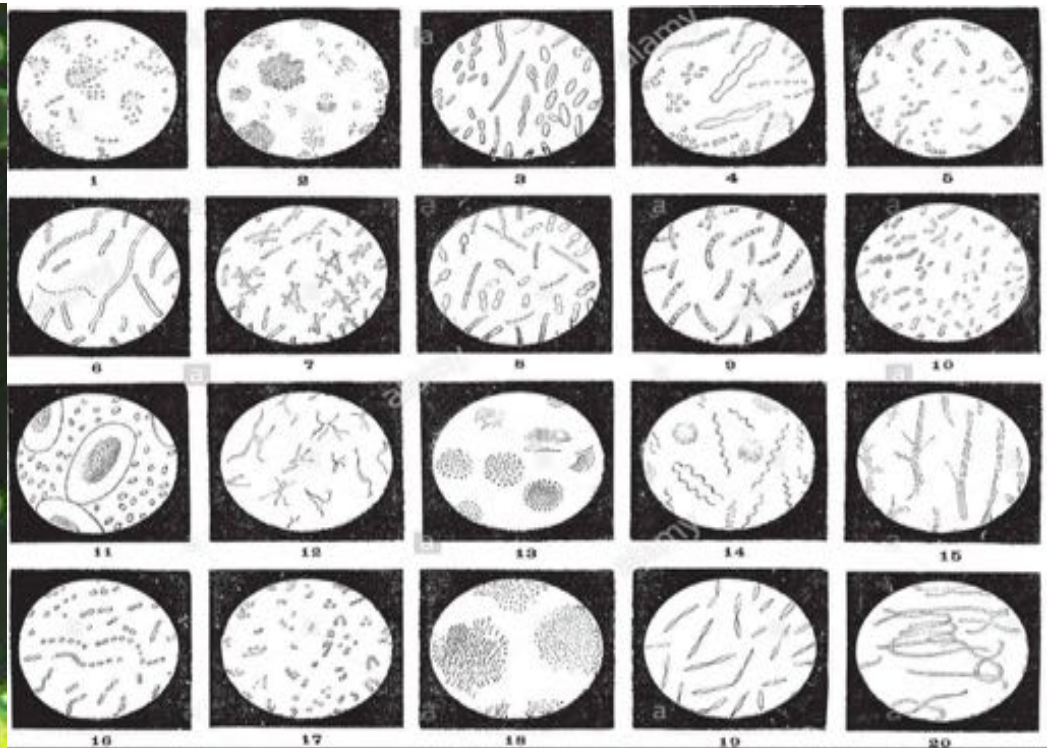
GoodMicrobes.org and
Recyclefoodwaste.org

ROHO COMPOST
FOOD WASTE SOLUTIONS

Bokashi Fermentation: A Microbial Love Affair!

Introduction: Who Am I? And What Is RoHo Compost?

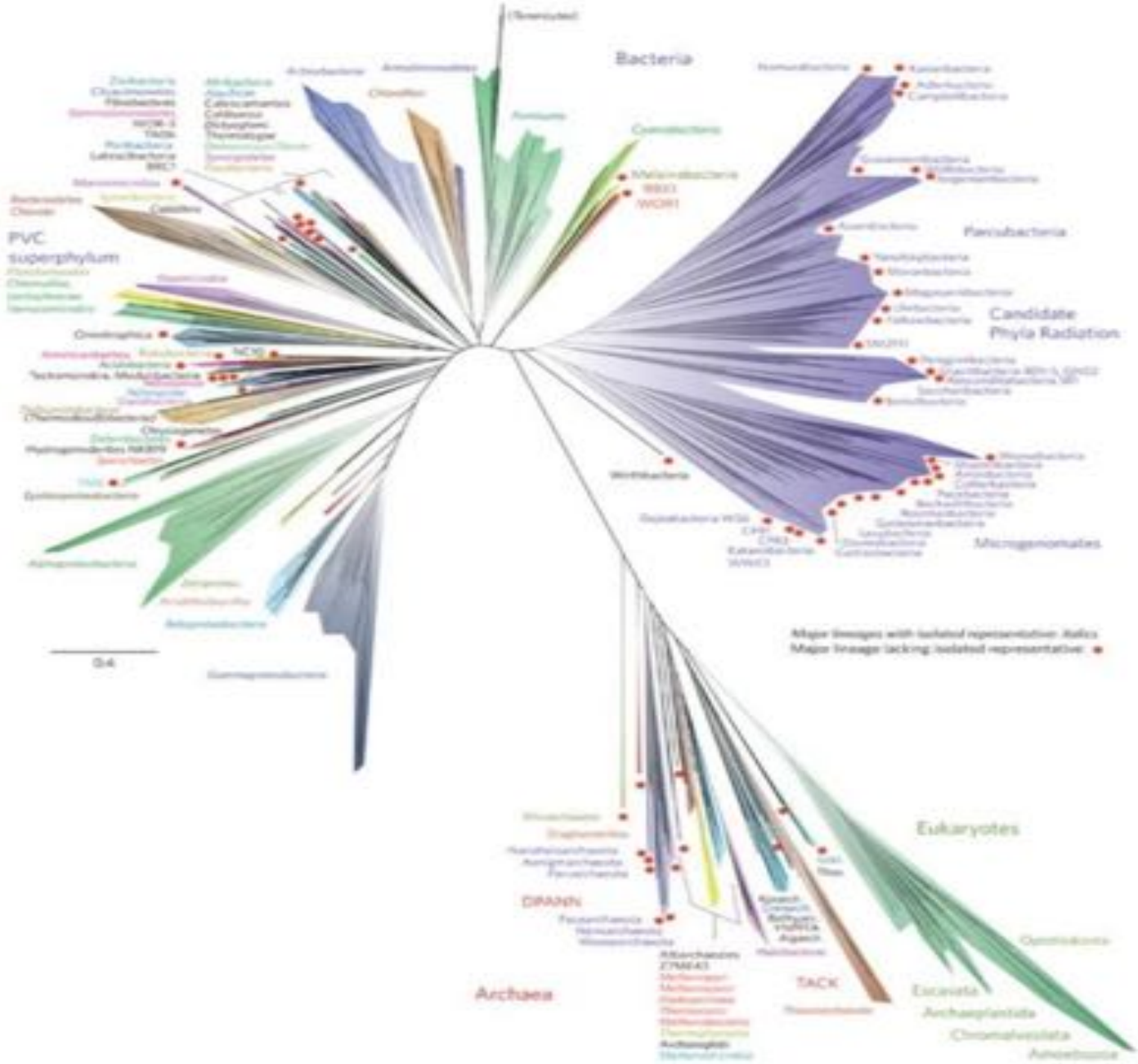
- MICRORGANISMS! Microorganisms = microbes = microscopic organisms
- Microorganisms include, archaea, bacteria, fungi, algae, protozoa, microscopic plants
- Microbes are ubiquitous all over the environment, in natural environments, as well as urban environments.
- They were the first organisms to populate the earth, and are attributed with the great oxygenation event 2 billion years ago that allow contemporary macrofauna to live on earth.
- They reside within the human body! (Gut Bacteria)



Some Key Terms and Concepts For Today:

- **Microbiome:** All of the microorganisms, their genome (complete set of genes/genetic materials), their habitat (a body or part of a body), and their surrounding environmental conditions.
  - The microbiome you foster determines how and what type of fermentation will occur
- Fermentation: The process of microbes breaking complex molecules into simpler ones. IE. sugar broken down into CO_2 and ethanol.
  - Fermentation has been a vital technique to make food edible year round for civilizations, before refrigeration was available. Lacto-fermentation is used to make yougurts and pickled foods like sauerkraut, kimchi, and yeast fermentation is used to make alcoholic beverages like beer and wine.
  - In certain civilizations, public health was maintained through widespread use of fermentation. Medieval English cities for example, did not have potable water available, so people fermented water with yeast and drank ale. (One has to wonder just how drunk everyone was all the time!)

Figure 1: A current view of the tree of life, encompassing the total diversity represented by sequenced genomes.



Basics of Fermentation

- There are several factors that influence the process of how microorganisms carry out fermentation
- The types of microbes present in the environment
- Temperature of the environment
  - Thermaphilic, mesophilic or psychrophilic
- The nutrients available within the environment for the microorganisms to feed on
- Whether it's a closed environment or not
  - Fermentation is often done in sealed containers, to prevent new microbes from being introduced in the local microbiome, that is developing as a closed system
  - The presence of oxygen influences microorganisms' metabolic pathways. **Bokashi fermentation is done anaerobically. (In the absence of oxygen)**

Uses of Bokashi For Land Application

Purposes:

- 1. As a microbial inoculant, to introduce microorganisms, improve microbial density and diversity
- 2. Nutrient bioavailability: to help release nutrients already in the soil; to add nutrients in the bokashi material
- 3. Organic matter content: Bokashi itself as a source of organic matter; help with organic matter buildup from surrounding sources

Applications:

- As a Soil Amendment In Gardening and Agriculture: various materials can used to make bokashi based on nutrient needs and aspects of the soil needing improvement.
- For Soil Remediation: Can be applied to biologically or chemically contaminated water or soil bodies in the form of activated EM or EM mudballs

The Practice of Bokashi Fermentation

- Utilizes fermentation pathways of Lactic Acid, Yeast, Fungi, and **Phototrophic microorganisms** to treat food neglect
- Food neglect normally decomposes and putrifies if untreated. Putrifiction and mismanagement of food neglect is a major problem in urban systems throughout the world.
- Bokashi fermentation preserves the nutrients within food waste, for later use
- Bokashi fermentation was discovered centuries ago, with evidence of use throughout Asia, particularly Japan, since the 17th century.

Cultivating Activated EM

- EM are the microorganisms that do the Bokashi “work.” EM stands for “effective microrganisms,” meaning they are not dormant, and are actively consuming a food source, reproducing and populating an environment
- EM are available most widely from a company called Teraganix, based in Texas. EM is a proprietary blend of microorganisms, cultivated through the Teraganix process
- EM is bottled, and can be purchased as a retail product

Demonstration Time! The Recipe

How to Make Activated EM

Preparations

- **Water** - preferably warm tap water.
- **Implements** - bowl or bucket to mix in, measuring cup, PETE plastic [soda] bottle(s) or glass bottle(s) with airlock, and (optional) a funnel.
- **Ingredients** - see list below.

Ingredients [example quantities below for making 2 liters (68 fl oz) using a 2-Liter seltzer bottle]

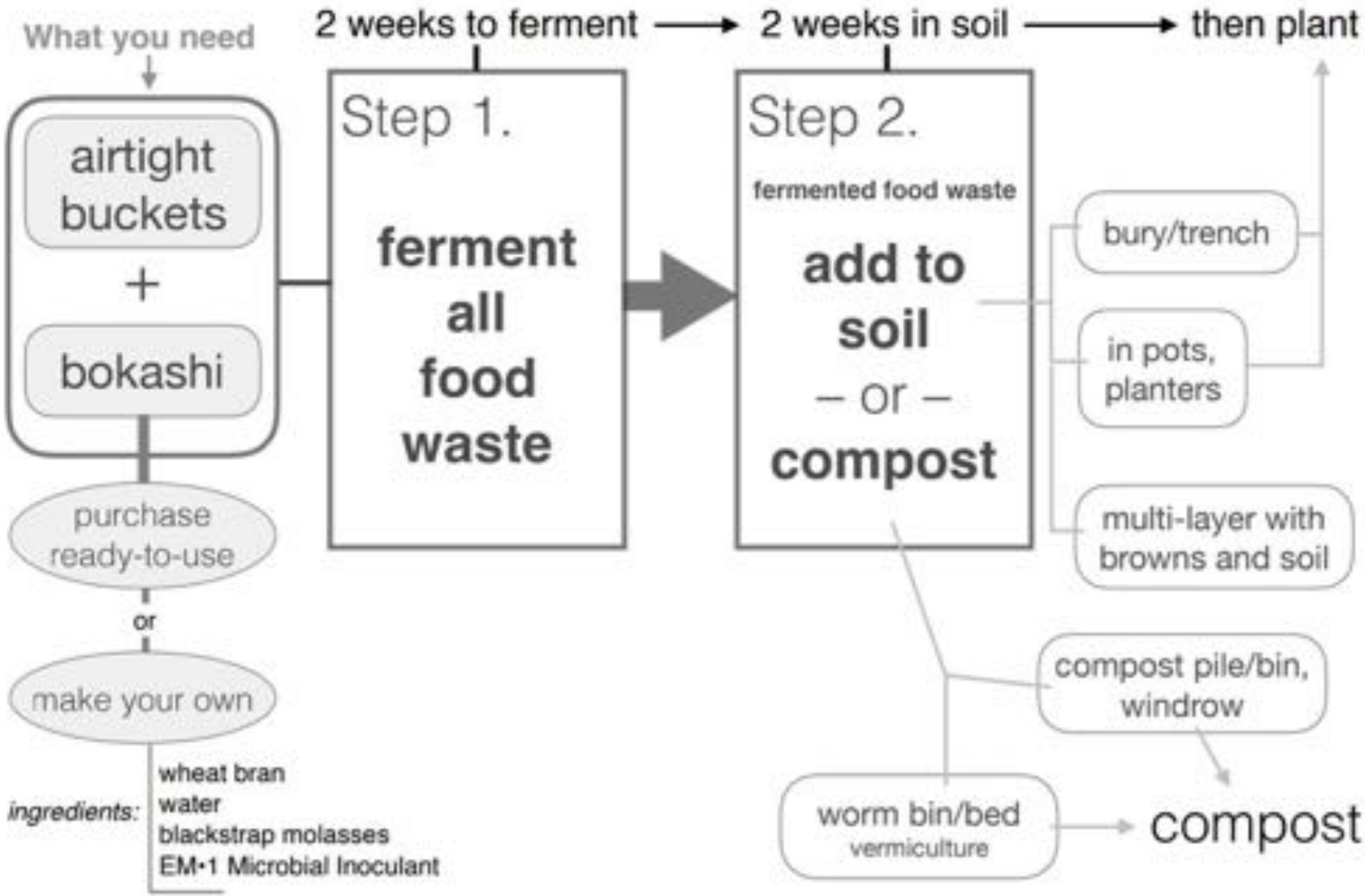
- **EM-1 Microbial Inoculant** (a liquid containing a combination of naturally existing microbes found in foods, soil, and water.)
  [5%, 3.5 fl oz or 7 tablespoons]
- **blackstrap molasses** (blackstrap, unsulfured sugarcane molasses; or high mineral content sugar material — if using some other sugar source, add a teaspoon of sea salt for mineral content.)
  [5%, 3.5 fl oz or 7 tablespoons]
- **water** (optional: heated to 100-120°F to make it easier to dissolve the molasses; otherwise, simply dissolve with a clean hand)
  [to fill the remainder of the bottle--have at least 2 liters of water readied]

Optional ingredients (may add one or more of the following depending on purpose)

sea salt [1 teaspoon] — adds minerals; helps in cleaning and deodorizing.
liquid mineral extract [a few drops to a dribble] — helpful for longer stable activated EM.
lemon [1 whole lemon, juice squeezed and the peel sliced and also added] — for cleaning, antiviral and anti-pathogenic properties; adds lemon scent.
Other materials may also be added, something that is known for their property, and the fermentation can then incorporate or enhance that property (e.g., apple cider vinegar at 5%).

The bokashi method
of recycling food waste

recyclefoodwaste.org



Garden Application Rules

- If general soil body within a garden needs nutrients or remediation, dig several pits, 2/3 feet deep, and bury bokashi inoculated food neglect
- If you are utilizing bokashi as a growth stimulant for specific plants you already have in your garden, dig pit 3 feet away from the root of a plant. The bokashi material cannot be too close to the roots, as its acidity will damage the roots
- If you already have a compost pile, you can add 3-5% bokashi material by volume as an inoculant for the process.

Can Bokashi Fermentation Rescue Our Citywide Management of Food Neglect?

VS.

RoHo Compost is using fermentation in its handling of food neglect, to address a nexus of problems:

- Pest Infestation
- Sanitary Storage Of Organic Neglect
- Prevent Pollution From Frequent Deployment Of Collection Trucks
- Lower Cost of Disposal For Businesses
- Potential for Residential Program Problems To Be Addressed As Well!

Expand Your Knowledge Of Bokashi!

- All information from this presentation is on recyclefoodwaste.org
- One of the United States' most knowledgable practioners of Bokashi, Shig Matsukawa, lives in New York, NY. He is extraordinarily generous with his time and attention, to people interested in Bokashi.
- I encourage you to attend his workshop, on 3/9/19, 12:30-2:30 at El Sol Brillante Community Garden. 526 E 12th St.
  (Between Avenue A & B)

Thank You All So Much!

- Support Apexart's amazing programs, at https://apexart.org/support.php
- Please support RoHo Compost!
- Donate to our cause at **Rohocompost.org**
- Contact us for food neglect services on our website, or through email, at

Rohocompost@gmail.com

or by calling us at **917 514 4309**.

- Stay up to date with our activities on instagram, **@rohocompost**
- Stay in touch! Let's build a circular economy, together!