

Methods for brewing aerated compost tea, to add beneficial microbes and plant available nutrients directly to plants throughout the growing season

## AERATED COMPOST TEA

13

0.00011-7.50µm

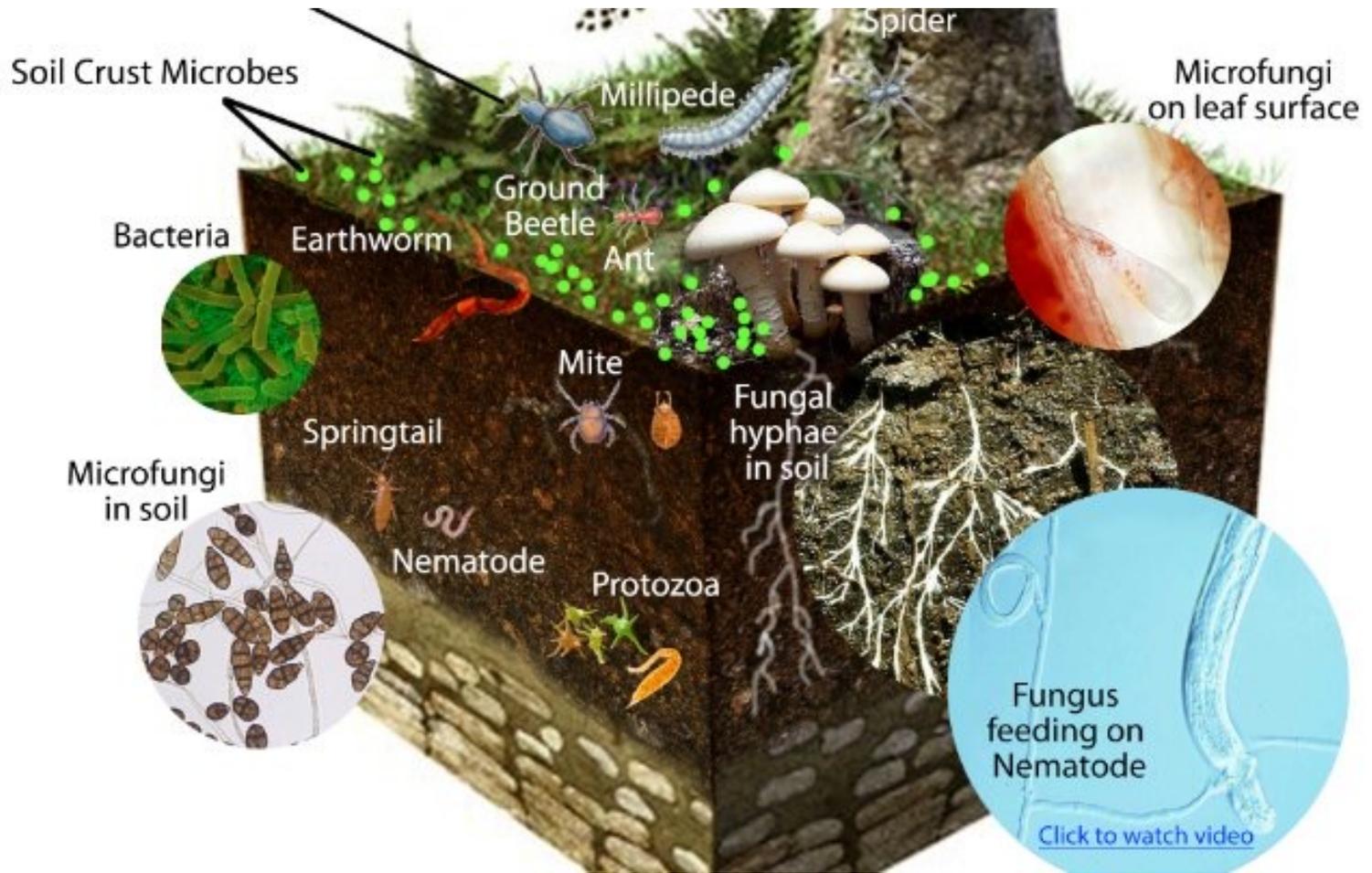


*ctn*ofa

# Compost Tea

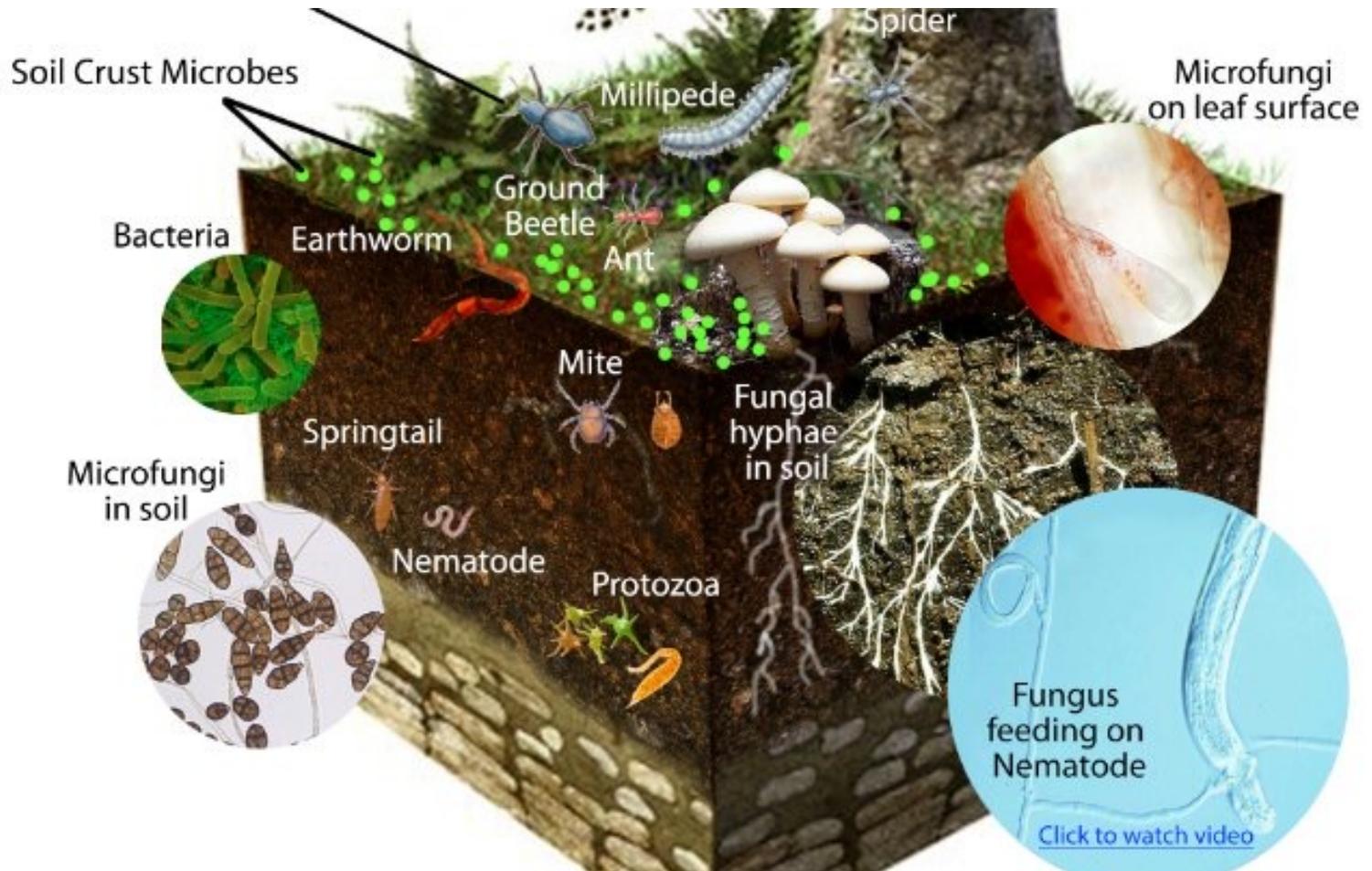
- **Compost Tea, an introduction**
- Benefits of Compost Tea
- How to make Compost Tea
- How to apply Compost Tea
- Proof that it works...

# Healthy LIVING Soil...



## Life In The Soil

“All plants in nature, and in healthy environments have well established symbiotic relationships with soil and leaf life.”





## **BIONUTRIENT** Food Association

“In nature, plants produce sugar (through photosynthesis) that is then fed by the plant (through its roots) to beneficial micro-organisms; namely bacteria and fungi. These microbes use that sugar to reproduce and access minerals out of the soil. These minerals are digested and then fed back into the plant. This symbiotic relationship is at the core of soil fertility.”

### CAKE AND COOKIES

“Roots release ‘Cakes and Cookies’ to feed microbes to:

- protect the root system from diseases and pests
- enhance **nutrient cycling**
- build structure to allow roots to grow”

From the book ‘Adding Biology by Dr. Elaine Ingham.

*(Diagram Courtesy of Soil Foodweb)*



### **PLANTS FEED MICROBES**

Exudates of Protein, Carbohydrates and Sugar

**“Cake and Cookies”**

### **Compost Tea:**

Compost tea is the result of aerobically brewing compost in water with added amendments to produce a highly nutritious food source for your plants



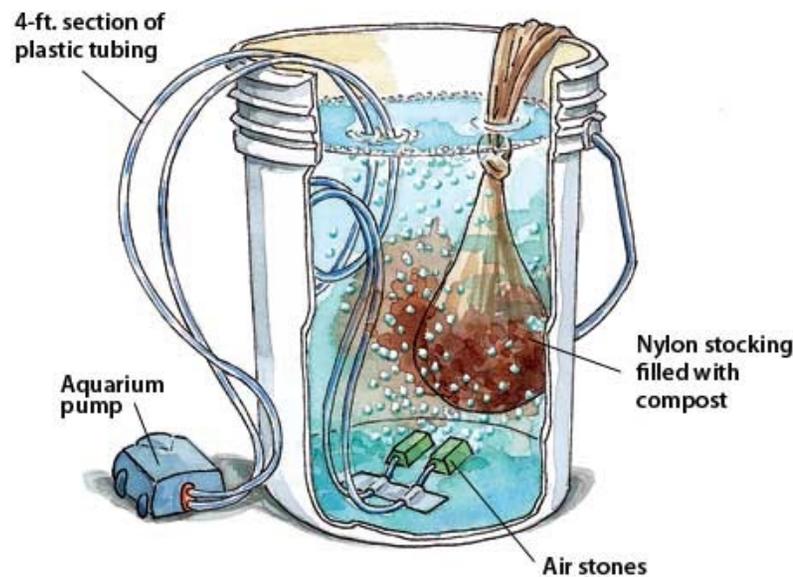
## Compost Extract

- Compost extract is compost suspended in water, no amendments added
- Microbes are released into the water, which is then added to plants



# Compost Tea vs. Compost Extract

- Compost tea is actively aerated (usually for 24 hours).
- Compost and amendments are added
- Oxygen is added, usually with a electrical pump
- Microbes consume the amendments and multiply
- The finished liquid is teaming with beneficial microbes



# Compost Tea

- Compost Tea, an introduction
- **Benefits of Compost Tea**
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## Potential Benefits of Compost Tea

- “Water retention in soil is improved, reducing water use by up to 70% in the first year in some cases.”



*Dr. Elaine Ingham*

### Potential Benefits of Compost Tea

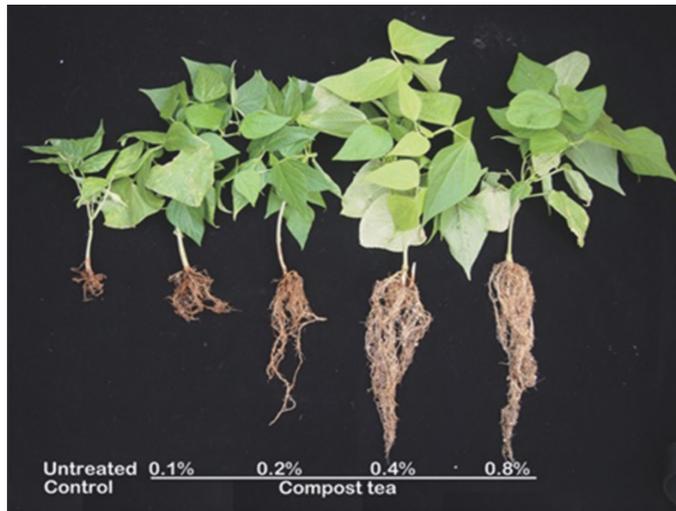
- “Water retention in soil is improved, reducing water use by up to 70% in the first year in some cases.”
- “Plants take up nutrients needed to resist infection more rapidly.”



*Dr. Elaine Ingham*

## Potential Benefits of Compost Tea

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- “Rooting depth of the plants is increased, increasing the nutrients the plant can access.”



*Dr. Elaine Ingham*

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*Dr. Elaine Ingham*

## **Potential Benefits of Compost Tea**

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- “Plants take up nutrients needed to resist infection more rapidly.”
- “Rooting depth of the plants is increased, increasing the nutrients the plant can access.”
- “Decomposition of dead plant material is increased.”
- “Chemical-based pesticides, herbicides and fertilizers are no longer used, and beneficial microorganisms in the ecosystem are no longer killed or harmed”

*Dr. Elaine Ingham*



ELSEVIER

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## Environmental Technology & Innovation

journal homepage: [www.elsevier.com/locate/eti](http://www.elsevier.com/locate/eti)



### Compost tea: Preparation, utilization mechanisms, and agricultural applications potential – A comprehensive review

Jie Yin, Jiani Wang, Lu Zhao, Zhongliang Cui, Sheng Yao, Guoxue Li, Jing Yuan<sup>\*</sup>

*State Key Laboratory of Nutrient Use and Management, Beijing Key Laboratory of Farmland Soil Pollution Prevention and Remediation, College of Resources and Environmental Sciences, China Agricultural University, Beijing 100193, China*

#### (3) Compost tea exhibits disease suppression effects

Compost tea can directly suppress pathogens. [El-Din and Hendawy \(2010\)](#) suggested that foliar application of compost tea provides beneficial microbes that colonize the leaf surface, potentially competing with pathogens. Compost tea can also activate the plant's immune system through its microbial content, enhancing disease resistance ([Egwunatum and Lane, 2009](#)). Research indicates that

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# Compost Tea brewing at Reservoir Community Farm:



# Aerated Compost Tea

## Method:

- Add amendments (food for bacteria and fungi) to non-chlorinated water (fish hydrolysate, kelp, humic acid)
- Brew Compost Tea for 24 hours, test under the microscope and apply within 3 hours
- Compost Tea can be applied to seeds, foliage, and roots of plants
- Can be applied anytime during the growing process, from seed to harvest



# Compost Tea – Proper Procedures For Organic Certification

## Inputs:

Worm castings or compost approved for organic growing.  
\*Recommend vegetative inputs only\*



# Compost Tea – Proper Procedures For Organic Certification

## **Inputs:**

- (1) Approved castings
- (2) Organic amendments (molasses not recommended, causes over-population of bacteria)
- (3) Non-chlorinated water

# Compost Tea – Proper Procedures For Organic Certification

## Inputs:

Organic amendments that are certified for organic growing, such as:

- fish hydrolysate
- liquid kelp
- fish bone meal
- alfalfa meal
- humic acid



\* molasses not recommended – causes over-population of bacteria

# Additives for brewing Compost Tea

## Common Compost Tea Additives

Ingredient	Feeds
Cane Sugar	Bacteria
White Sugar	Bacteria
Maple Syrup	Bacteria
Corn Syrup	Bacteria
Fish Emulsion	Bacteria
Yeast Extract	Bacteria
Bone Meal	Bacteria
Raw Milk or Nonfat Dried Milk	Bacteria
Organic Unsulfured Molasses	Bacteria/Fungi
Sea Kelp	Bacteria/Fungi
Fruit Pulp	Bacteria/Fungi
Humic Acids	Bacteria/Fungi
Rock Dusts	Bacteria/Fungi
Fish Hydrolysate	Fungi
Ground Oatmeal	Fungi
Oat Bran	Fungi
Yucca	Fungi
Lignin	Fungi
Cellulose	Fungi
Soybean Meal	Fungi

New research indicates that simple sugars, such as molasses, promote excessive bacterial growth and should be avoided.

## Brewing Compost Tea

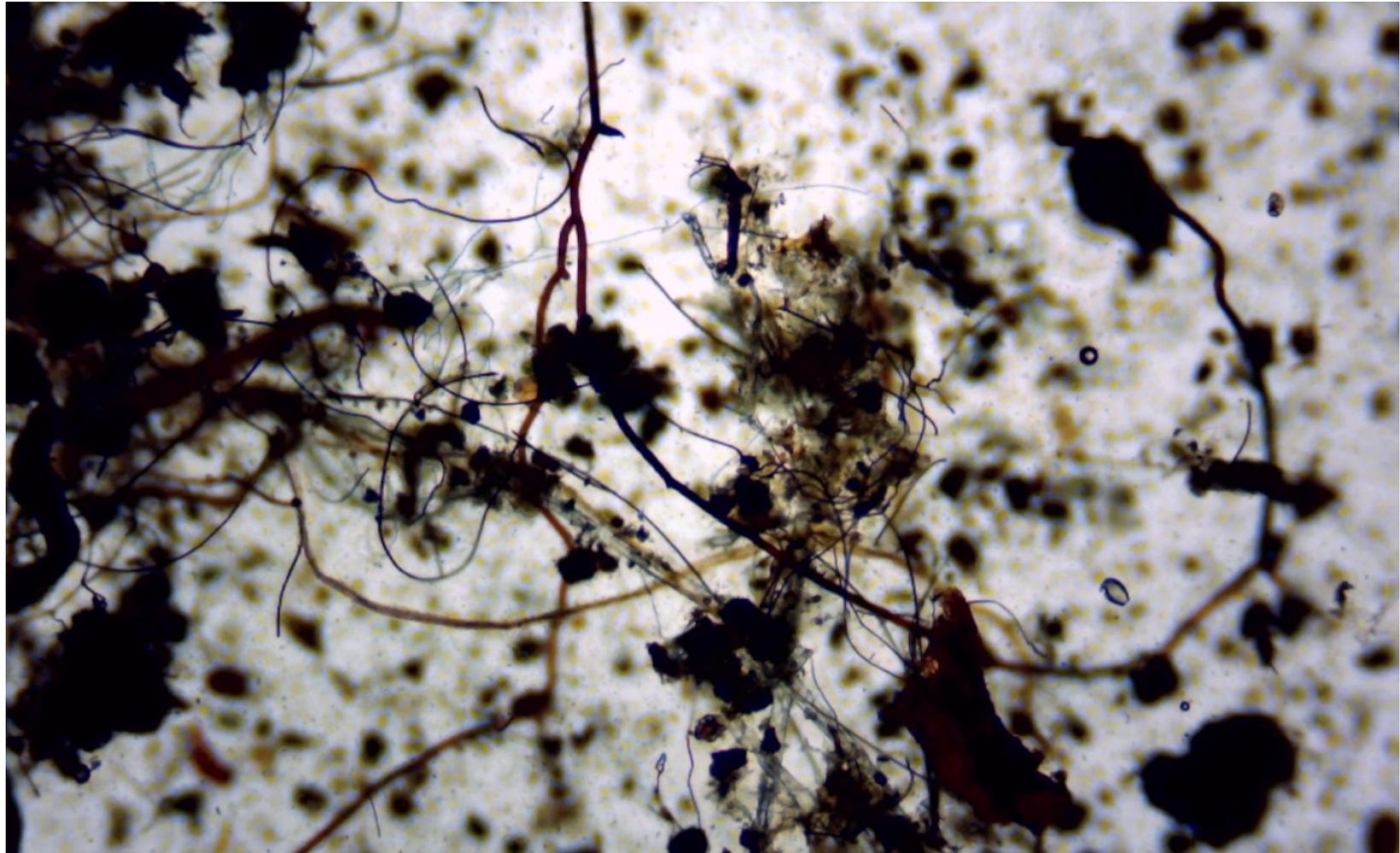


## Compost Tea

One way to get the indigenous beneficial microorganisms into the tea is to add a pound of fungal dominant soil to your Compost Tea brew...



## High Fungal Soil – Compost Tea



# High Fungal Soil – Compost Tea – Treated Mounting Laurel (3 years later)



# High Fungal Soil – Compost Tea – Treated Mounting Laurel (3 years later)



# Compost Tea – Proper Procedures For Organic Certification

## Method:

(1) Vessel must be clean, free of biofilm...



# Compost Tea – Proper Procedures For Organic Certification

## Method:

- (1) Vessel must be clean, free of biofilm  
(use hydrogen peroxide as cleaning agent, avoid chemical cleaners)

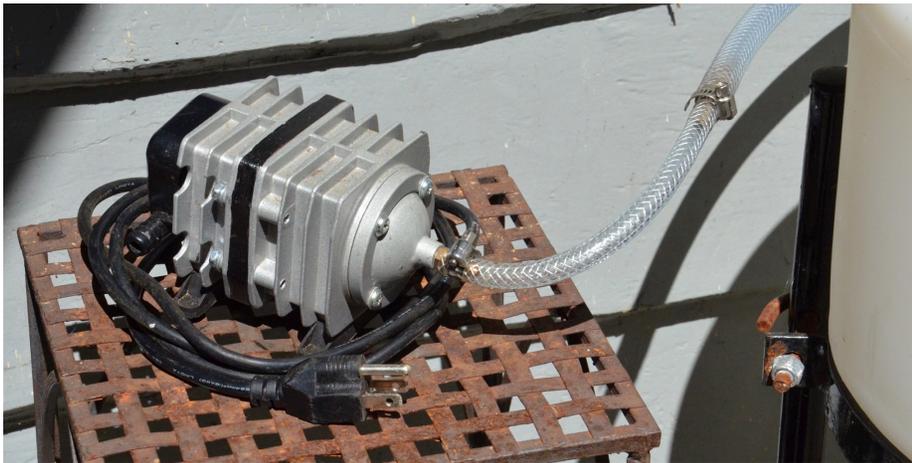


# Compost Tea – Proper Procedures For Organic Certification

## Method:

(2) Aerobic conditions should be maintained within the brewer by using the following protocol:

- maintain minimum power of 1.35 watts per gallon with air pump
- Inverted cone shape recommended to avoid anaerobic areas within the brewer



# Compost Tea – Proper Procedures For Organic Certification

## **Method:**

(3) Brew compost tea aerobically for approx. 24 hours



## Compost Tea – Proper Procedures For Organic Certification

### **Method:**

(4) Compost tea should be tested periodically with a microscope to ensure aerobic, balanced conditions with healthy microbial populations

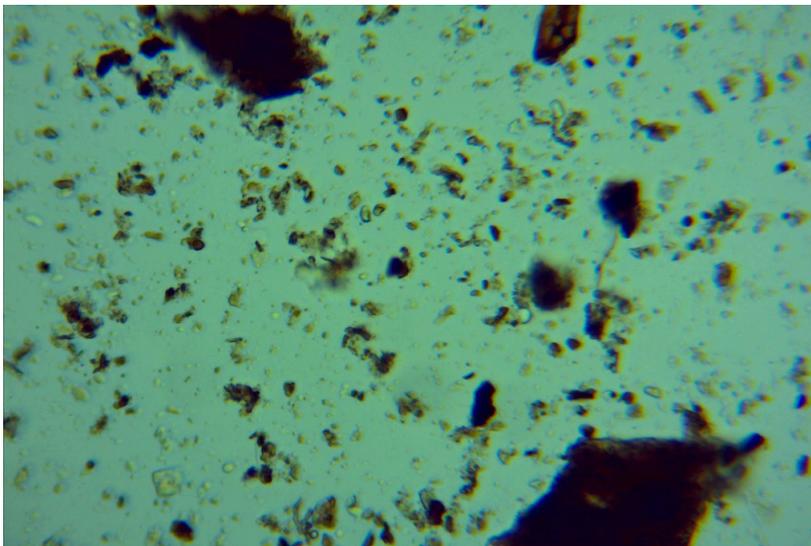


## Compost Tea – Proper Procedures For Organic Certification

### **Method:**

(4) Compost tea should be tested periodically with a microscope to ensure aerobic, balanced conditions with healthy microbial populations.

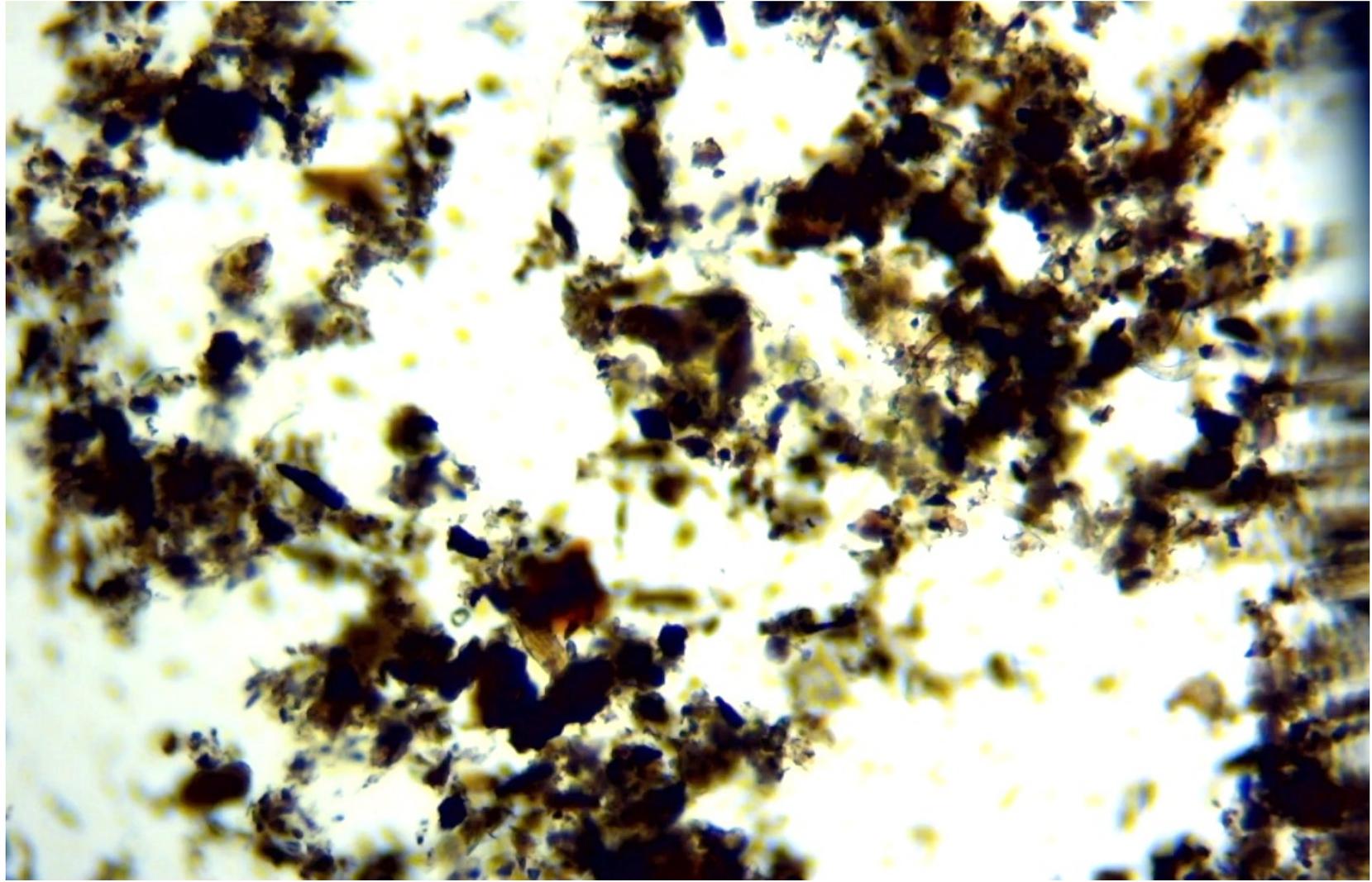
Testing should be done after brew is complete (24 hours after start). Suggest checking microscopy every 4-5 brews, or if changes are made to inputs or method of brewing.



Compost Tea brewing  
is all about the Aeration...



# Compost Tea Over Time



# Compost Tea – Proper Procedures For Organic Certification

## Method:

(5) Compost tea should be used within 8 hours. Tea should not be stored in sealed containers for more than 4 hours

(6) Compost Tea brewer should be emptied completely, cleaning any or hosing that comes in tea to remove 'biofilm'



## Compost Tea – Proper Procedures For Organic Certification

**Method:**

- (8) Dilution possible. No restrictions  
(dilute with non-chlorinated water)



## Compost Tea – Quality Control

- There should be NO SMELL at any time. Bad smells indicate anaerobic conditions



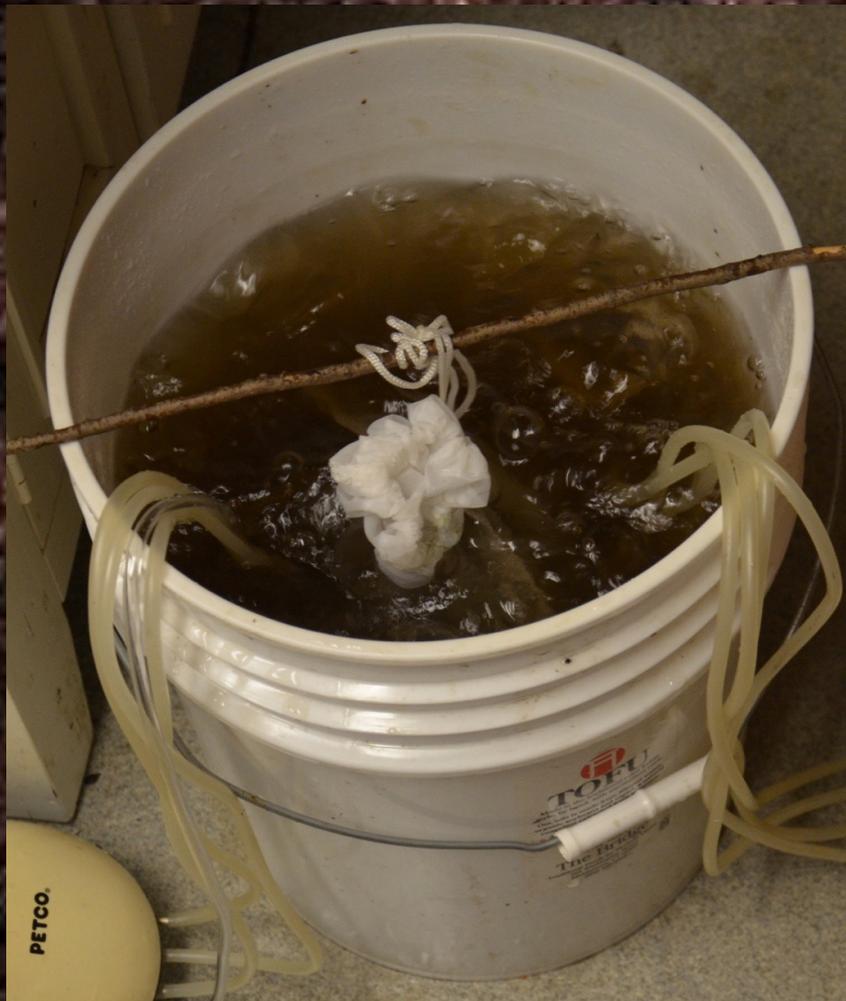
**For 5 gallon tea brew:**

1.6 T. kelp

1.2 t. fish hydrolysate

1 t. humic acid

add 2 cups worm compost



**For 50 gallon tea brew:**

1 cup kelp

¼ cup fish hydrolysate

3 T. humic acid

add 10 lbs. worm compost



## Training and Equipment

### Hickories Farm – Brewing compost tea – August 2019



## Hickories Farm – Brewing compost tea – August 2019



## Hickories Farm – Brewing compost tea – August 2019

Sprayers for Compost Tea:

- Oversized plumbing for easy cleaning
- Diaphragm pumps
- Agitation systems



# Compost Tea

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- How to make Compost Tea
- **How to apply Compost Tea**
- Proof that it works...

# The Compost Tea Brewing Manual

**Fifth Edition**

By

**Elaine R. Ingham, PhD**



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**SOIL FOODWEB INCORPORATED**

728 SW Wake Robin Ave

Corvallis, Oregon 97333

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## FOLIAR SPRAYING

- When applying compost tea to leaf surfaces, the key is getting at least **70% of the leaf covered** with the tea organisms - on **both sides of the leaves**
- Do not apply tea when it is raining hard, but a light mist often helps the organisms establish a foothold on the leaf
- Tea should be applied during weather when plants are active. This means starting at two weeks before bud break, through to senescence of all plants
- Tea should be applied so liquid remains on the leaf, stem and flowers of the plant, and not drip off. The larger the drop size, the more likely the tea will run off the plant

## Foliar Spray

### How to use compost tea:

- The tea should be sprayed as soon as possible for maximum effectiveness



## Foliar Spray

### **How to use compost tea:**

- The tea should be sprayed as soon as possible for maximum effectiveness
- Use it as a foliar spray by spraying all stems and leaves (both sides)



## Root Drench

### **How to use compost tea:**

- The tea should be sprayed as soon as possible for maximum effectiveness
- Use it as a foliar spray by spraying all stems and leaves (both sides)
- Use it as a root drench by soaking the soil around your plants' roots



## Compost Tea

### **How to use compost tea:**

- The tea should be sprayed as soon as possible for maximum effectiveness
- Use it as a foliar spray by spraying all stems and leaves (both sides)
- Use it as a root drench by soaking the soil around your plants' roots
- The tea can be applied to any type of plant, including vegetables, flowers, and trees

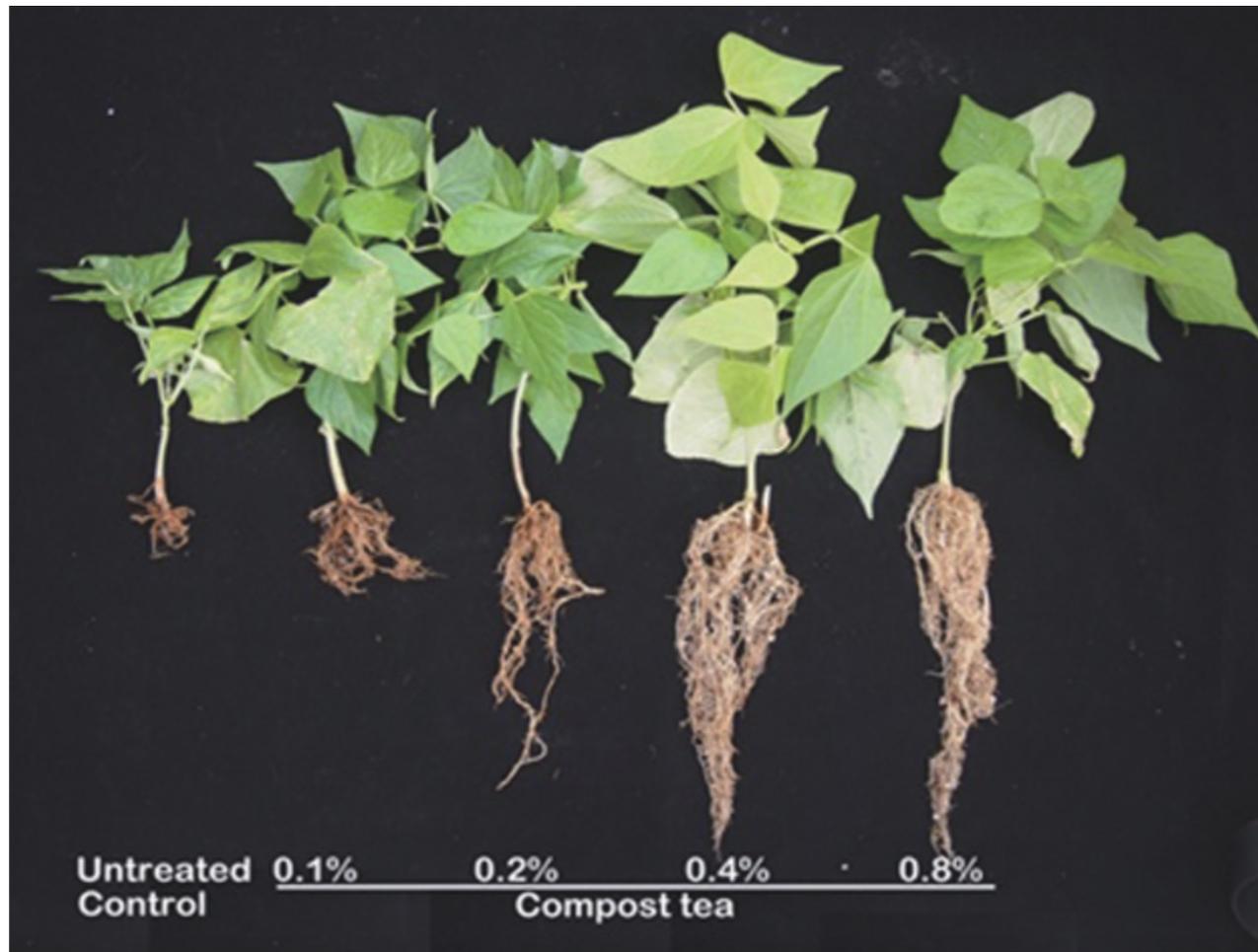


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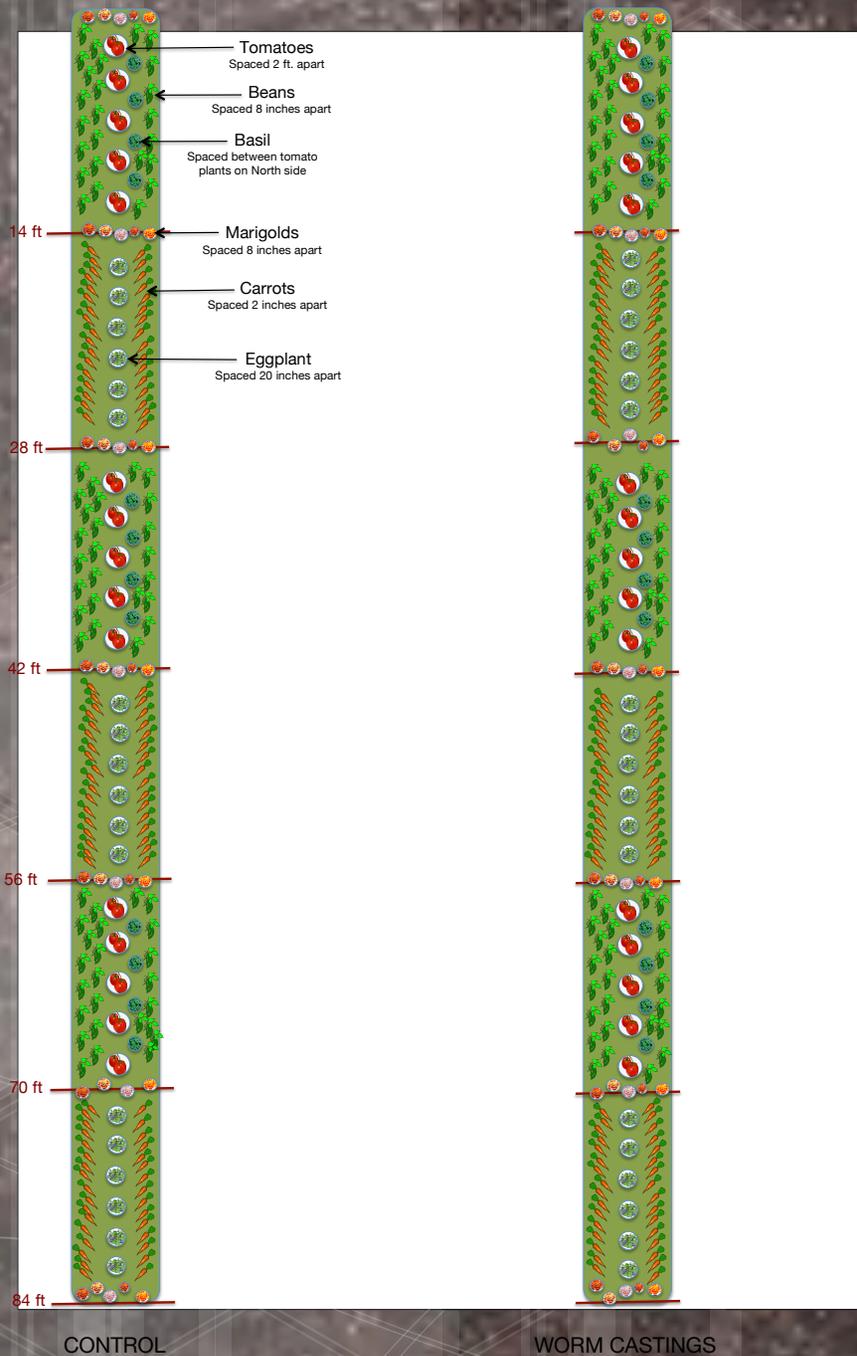
## Benefits of Compost Tea

“Misting plants with compost tea is a more effective method for delivering nutrients thereby boosting than drenching the soil.” (Arancon et al., 2006; González et al.



# Test Trial The Hickories Farm 2019

Showing the effect  
of adding  
worm castings and  
worm compost tea  
to organic  
vegetable crops  
on tilled beds



# Test Trial - The Hickories Farm



## Soil Test Report



## Soil Test Report

'Before trial' soil tests showed higher nutrients in control bed vs. the bed treated with worm castings and compost tea

moniqueb@optonline.net  
203-858-8829

### South Bed Control

#### Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.4	
<b>Modified Morgan extractable, ppm</b>		
<i>Macronutrients</i>		
Phosphorus (P)	(2.8 X higher) 36.2	4-14
Potassium (K)	(1.6 X higher) 368	100-160
Calcium (Ca)	(1.4 X higher) 3122	1000-1500
Magnesium (Mg)	(1.4 X higher) 484	50-120
Sulfur (S)	(1.3 X higher) 24.1	>10
<i>Micronutrients *</i>		
Boron (B)	(1.7 X higher) 1.4	0.1-0.5
Manganese (Mn)	5.6	1.1-6.3
Zinc (Zn)	(1.2 X higher) 2.2	1.0-7.6
Copper (Cu)	0.1	0.3-0.6
Iron (Fe)	3.7	2.7-9.4
Aluminum (Al)	14	<75
Lead (Pb)	1.2	<22

moniqueb@optonline.net  
203-858-8829

### North Bed W.C.

#### Results

Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	6.1	
<b>Modified Morgan extractable, ppm</b>		
<i>Macronutrients</i>		
Phosphorus (P)	12.8	4-14
Potassium (K)	231	100-160
Calcium (Ca)	2174	1000-1500
Magnesium (Mg)	342	50-120
Sulfur (S)	17.9	>10
<i>Micronutrients *</i>		
Boron (B)	0.8	0.1-0.5
Manganese (Mn)	(1.4 X higher) 7.8	1.1-6.3
Zinc (Zn)	1.8	1.0-7.6
Copper (Cu)	(2 X higher) 0.2	0.3-0.6
Iron (Fe)	(2 X higher) 7.6	2.7-9.4
Aluminum (Al)	(1.6 X higher) 22	<75
Lead (Pb)	1.3	<22

## **WORM CASTINGS added to W.C. bed**

- 10% added to seed starting mix



## **WORM CASTINGS added to W.C. bed**

- 10% added to seed starting mix
- ½ cup added to eggplant and basil during transplant
- 1 cup added to tomato during transplant



Compost Tea applications – foliar spray and root drench every 3 weeks, starting June 28<sup>th</sup>.  
(5 applications)

## 2 Gallon Recipe

### Control

- 1 T. Liquid Kelp
  - 1 t. Fish Hydrolysate
  - 1 t. Humic Acid
- APPLY IMMEDIATELY**

### Worm Castings/Compost Tea

- 1 T. Liquid Kelp
  - 1 t. Fish Hydrolysate
  - 1 t. Humic Acid
  - 1.5 cups Worm Castings
- BREW FOR 24 HOURS**

**August 8<sup>th</sup> & 12<sup>th</sup>**

Tomatoes – Control  
Harvested 9.08 lbs.

Tomatoes – W.C.  
Harvested 19.27 lbs.



**August 29th**

Tomatoes – Control

Tomatoes – W.C.

**4 days after Harvest**



## September 3<sup>rd</sup> Harvest

Eggplant – Control



Eggplant – W.C.



Sept. 11th

Tomatoes – Control

Tomatoes – W.C.

2 days after Harvest



## September 20<sup>th</sup> Harvest

Eggplant – Control

Eggplant – W.C.



## September 24<sup>th</sup> Harvest

Eggplant – Control

Eggplant – W.C.



## September 29<sup>th</sup> Harvest

Eggplant & Tomatoes  
Control

Eggplant & Tomatoes  
W.C.



**October 4<sup>th</sup> Harvest**  
(frost expected)

Control bed vs. bed with worm castings/compost tea

Eggplant – Control

Eggplant – W.C.



**October 4<sup>th</sup> Harvest**  
(frost expected)

Tomatoes – Control

Tomatoes – W.C.



**October 4<sup>th</sup> Harvest**  
15 days later (Oct. 19<sup>th</sup>)

Tomatoes – Control

Tomatoes – W.C.



## Effects of Compost Tea



Summer Squash – Sept. 8 – before  
foliar application of compost tea



Summer Squash – Sept. 8 – 10 minutes  
after foliar application of compost tea

## Effects of Compost Tea



Summer Squash – Sept. 11 – 3 days after foliar application of compost tea

## Effects of Compost Tea



Summer Squash – Sept. 12 – 4 days after foliar application of compost tea

## Effects of Compost Tea



Summer Squash – Sept. 18 – 10 days after foliar application of compost tea

## Effects of Compost Tea



Summer Squash – Sept. 21 – 13 days after foliar application of compost tea

## Instructions and Shopping List for Compost Tea Brewing in a 5 gallon bucket: +-\$120

For the recipe, I use these measurements for a 5-gallon bucket:

### **For 5 gallon tea brew:**

**1.6 T. kelp**

**1.2 t. fish hydrolysate**

**1 t. humic acid**

**add 2 cups worm compost**



### Day One:

- Fill CLEAN 5-gallon bucket with water
- If chlorine in water, let sit

### Next Day:

- Set up your aquarium air pump
- Add amendments, let bubble for 10 minutes
- Add worm castings to 400-micron mesh bag,
- Use stick to hold bag over bucket
- Bubble for 24 hours
- Apply right away, as foliar spray and root drench



## Materials to Purchase:



**Penn-Plax Standard Airline Tubing for Aquariums – Clear and Flexible – Resists Kinking – Safe for Freshwater and Saltwater Fish Tanks – 25 Feet** **\$6.40**

In Stock  
✓prime One-Day  
FREE delivery **Tomorrow, Jul 26**  
FREE Returns ✓  
 This is a gift [Learn more](#)  
Size: 25 Feet

Qty: 1 | Delete | Save for later | Compare with similar items | Share



**AQUANEAT Aquarium Air Pump 300GPH, for up to 200 Gallon Fish Tank, Powerful Hydroponic Aerator Pump, Adjustable Oxygen Bubbler** **\$23.83**

In Stock  
✓prime One-Day  
FREE delivery **Tomorrow, Jul 26**  
FREE Returns ✓  
 This is a gift [Learn more](#)

Qty: 1 | Delete | Save for later | Compare with similar items | Share



**400 Micron Nylon Monofilament Mesh Filter Bags 7 Inch Ring by 16 Inch Long - Filter Socks Size 1 Liquid Filtering - 1 Pack (400 Micron 7" x 16")**

Brand: Honritone  
4.1 ★★★★★ | 53 ratings | [Search this page](#)

**\$9<sup>99</sup>**

Size: **400 Micron 7" x 16"**

50 Micron 7" x 16" \$10.99	75 Micron 7" x 16" \$10.99 ✓prime	100 Micron 7" x 16" \$10.59
150 Micron 7" x 16" \$9.96	200 Micron 7" x 16" \$10.99	300 Micron 7" x 16" \$10.79
<b>400 Micron 7" x 16"</b> <b>\$9.99</b>	500 Micron 7" x 16" \$10.69 ✓prime	

# Life in the Soil



📌 **Organic Kelp Fertilizer by GS Plant Foods - Omri Listed(1 Gallon) - Liquid Kelp Concentrate for Gardens, Lawns & Soil Yields**  
800+ gallons

Visit the [GS Plant Foods Store](#)  
4.7 ★★★★★ 3,258 ratings  
1K+ bought in past month

**-10%** \$35<sup>95</sup> (\$0.28 / Fl Oz)

One-Time Price: \$39.95

FREE Returns

With Amazon Business, you would have saved \$156.25 in the last year. Create a free account and save up to 5% today.

Size: 1 Gallon

<b>1 Gallon</b> \$35.95 (\$0.28 / Fl Oz)	5 Gallon \$164.95 (\$0.26 / Fl Oz)	32 Liquid Oz \$18.95 (\$0.59 / Fl Oz)	55 Gallon \$895.00 (\$0.13 / Fl Oz)
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📌 **Fish Fertilizer - Omri Listed Hydrolyzed Fish Fertilizer for Plants (1 Quart) - Liquid Organic Fertilizer for Vegetables, Fruit, Lawns, Blooms & Plants**

Visit the [Indian River Organics Store](#)  
4.6 ★★★★★ 969 ratings | Search this page  
200+ bought in past month

**\$19<sup>95</sup>** (\$0.62 / Fl Oz)

prime One-Day

FREE Returns

With Amazon Business, you would have saved \$156.25 in the last year. Create a free account and save up to 23% today.

Size: 1 Quart

1 Gallon \$35.05 (\$0.27 / Fl Oz) prime	<b>1 Quart</b> <b>\$19.95</b> <b>(\$0.62 / Fl Oz)</b> prime
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Roll over image to zoom in

📌 **Organic Liquid Humic Acid, 32 fl oz Concentrate**

Visit the [GS Plant Foods Store](#)  
4.5 ★★★★★ 933 ratings | Search this page  
**Amazon's Choice** in Garden Fertilizers by GS Plant Foods

200+ bought in past month

**\$19<sup>95</sup>** (\$0.62 / Fl Oz)

prime One-Day

FREE Returns

With Amazon Business, you would have saved \$156.25 in the last year. Create a free account and save up to 10% today.

Size: 36 OZ

1 Gallon \$34.15 (\$0.27 / Fl Oz) prime	5 Gallons \$164.95	<b>36 OZ</b> <b>\$19.95</b> <b>(\$0.62 / Fl Oz)</b> prime	55 Gallons \$895.00 (\$0.13 / Fl Oz)	275 Gallons \$2,865.00
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**Brand** GS Plant Foods  
**Item Weight** 2 Pounds  
**Item Form** Liquid  
**Coverage** Medium  
**Liquid Volume** 32 Fluid Ounces

**“Essentially all life depends on the soil. There can be no life without soil and no soil without life; they have evolved together.”**

Charles E Kellogg,  
*USDA Yearbook of  
Agriculture, 1938*

