# **Crystal Creek plant trials 2024**

**Goal** – Evaluate different iterations of Enhanced Biochar made from dairy manure solids on multiple crops to determine any changes in yield and quality

### Trial #1 - Cooperator - Lighthouse Farms – Lima, NY Todd Lighthouse

Lighthouse Farms grows about 500 different varieties of herbs, vegetables and flower crops and sells them wholesale to garden centers and other greenhouses for finishing.

**Greenhouse trial** -goal is to evaluate several iterations of Enhanced Biochar on greenhouse crops to help determine beneficial recipes for future trials.

Crop – Basil grown from seed

### Protocol

Several iterations of Enhanced Biochar were blended at 5% rate by volume into Lighthouse custom soil mix, and several bags of each were created for future trials.

Iteration #1 – control -standard soil mix

Iteration # 2 - raw Biochar

Iteration #3 - Biochar with Wood Vinegar (WV) at 100-1 dilution

Iteration # 4 - Biochar with Wood Vinegar (WV) at 100-1 dilution + 4 oz. of beneficial microbes

Iteration # 5 - Biochar with WV at 50-1 dilution

Iteration # 6 - Biochar with WV at 50-1 dilution + 4 oz. of beneficial microbes

Iteration # 7 - raw Biochar + 4 oz. of beneficial microbes

Iteration # 8 – Biochar liquid suspension

- 4 oz. of concentrated beneficial microbes in premix is equivalent to 1.5 -2 gallons per acre

Seeds were planted in trays and then transplanted into 4-inch containers. Root growth and plant growth were measured at intervals.

72 plugs (cells) of each of the 8 treatments were sown, which is 1/2 of a propagation tray per treatment. Each cell has received exactly 5 seeds per cell.

Also filled 2 separate plug trays with all 8 treatments (2 rows=18 cells each) We then sowed 1 of those trays with basil and 1 with beans. These 2 trays will allow for quick comparison.

### Photos from trial:



Photo 1-Test groups 1-4

Seedlings from trays repotted.



Photo 2 - test groups 5-8

### **Results:**

Flats from seed

Todd Lighthouse said the iterations with wood vinegar were more stunted through the early growth phase, but they caught up and were nice compact plants at the sell stage. By May 15<sup>th</sup> – based on the evaluations of the root systems and the ready for sale plants in pots, there did not appear to be significant differences in plant quality and salability between the different Biochar iterations. This led us to focus on a single iteration for the subsequent tomato field trial.

### Trial #2 - Cooperator – Wayne Malinowski – Livonia NY

Wayne field grows 3-4 different types of tomatoes in greenhouses, shade houses, and open air – all with trellises. He produces about 10-12,000 lbs. of tomatoes per year and sells all at his home stand.

### **Crop - Field grown tomatoes**

### Protocol:

Tomato plants grown in greenhouse prior to field trial. Planted in late May. Enhanced Biochar with Nutrients, Wood Vinegar, and 9 beneficial microbes added were chosen for the trial.

**Sub Trial #1**- Work one iteration of Enhanced Biochar into the soil preplant while maintaining all other inputs of standard fertility program. Applied at 2 rates – equivalent to 1000 lbs. /A on one full row, and then 2000 lbs/A equivalent on 10 plants in that row. 3 other rows are used as a control/ All tomatoes are weighed upon picking.

**Sub Trial # 2** – Apply Enhanced Biochar on one row and leave out the 10-10-10 application. Compare to next row with standard application as control. These two rows are in a rear shade house, planted in mid- June. They were not harvested as often as the first trial as it was excess production.

**Standard fertility** – 10-10-10 applied preplant and worked in. Calcium and liquid nutrient package added weekly through drip irrigation

## Photos from trial:



5/29 at planting

6/12 mid growth stage



7/13 growth stage

8/17 - blight starting

# Wayne Malinowski tomato trial data for Crystal Creek

Data for tomato trials (greenhouse grown seedlings):

# Trial #1

Trial #1 - 1000 lbs./A equivalent of				
Enhanced Biochar spread and				
worked into soil preplant				
	# of	lbs. of		
	plants	tomatoes	lbs./plant	difference
		harvested		from control
Enhanced Biochar	86	640	7.44	9%
1000#/A equivalent				
Enhanced Biochar	10	56	5.60	-18%
2000#/A equivalent				
Enhanced Biochar Total	96	696	7.25	6%
Control rows	384	2625	6.84	0

# Trial #1 results

The Enhanced Biochar yielded an impressive 9% increase in pounds of tomatoes harvested vs. the control with the standard fertility package. The 10 plants that were treated with a double rate on the Enhanced Biochar row had a lower yield than both the 1000 lb. /A rate, as well as the control rows. We can speculate there could be a

detriment to overapplication – perhaps the higher amount of Biochar sequestered more of the applied nutrients and limited uptake somewhat during the growing season.

# Year over year comparison-

Wayne Malinoski noted that in 2023 he picked for 48 days with an overall average of 8.8 lbs. per plant harvested. However, in 2024, due to blight – he was only able to pick for a total of 36 days for an average of 6.85 lbs. per plant. The blight kills off the plant leaves starting from the bottom and reduces protection from sun scald and rot. There were still tomatoes on the plants, but the remaining quality was not up to his saleable standard.

# Trial #2

Trial #2 - 1000 lbs./A equivalent of				
Enhanced Biochar spread and				
worked into soil preplant				
	# of	lbs. of		
	plants	tomatoes	lbs./plant	difference
		harvested		from control
Enhanced Biochar	86	81	0.94	-74%
1000#/A equivalent				
no 10-10-10				
Control row	92	339	3.68	0
with 10-10-10, no Biochar				

## Trial #2 results

The trial #2 was used to determine if the enhanced Biochar may be able to replace or reduce the need for the standard 10-10-10 application and still have a similar yield. However, just the opposite occurred. These two rows were in a rear shade house (vs trial #1 in open field), and they were "extra " production so he did not pick them as often.

Notes on July 12<sup>th</sup> (about 4 weeks after planting)



There seems to be a difference in the row that had Biochar only vs. the next row that had standard fertilizer. The Biochar only is shorter and less bushy vs the standard fertilizer row is taller and just flowering. The with Biochar row is on left of picture. Note some tomatoes starting to form. Standard fertilizer row on right in second pic. Just flowers so far.

Wayne the grower said the fertilized plants tend to be bushy and that is good to shade the tomatoes from sun scald. He is concerned about blight disease this time of year, and that usually shows up in the lower leaves first. He then trims those off rather than spraying a fungicide

### Final appraisal:

Due to the big yield difference, it appears that the enhanced Biochar did not provide enough benefits to supplement the tomatoes without the fertilizer application. We can speculate that it took in and sequestered some of the soil available nutrients and did not make them available for plant uptake. Future research with a reduced amount of 10-10-10 may be beneficial to determine

some equilibrium in yield vs. application savings.