**OREI HT Research Assessment Report**

**3/16-17/2021**

**UF PSREU in Citra, FL**

Table 1, Plot Key of Experimental Treatments in the Organic High Tunnel Tomato Trial

|  |  |
| --- | --- |
|   | **Treatments**  |
| **Cover Crop**  | **None**  | **‘Iron & Clay’ Cowpea** 100 lbs/acre  |
| **Fertilization**  | **Granular fertilizer** Natursafe 10-2-8 260 lbs N/acre estimated total 50 lbs N/acre at transplanting Side dressing every four weeks  | **Liquid fertigation (5-1-1)** Sulfate of potash to match K with granular fertilizer rate  |
| **Compost\***  | **None\***  | **Cow manure** 10 tons/acre 14:1 (C:N)\*  | **Vermicompost** 2.5 tons/acre 12:1 (C:N)\*  | **Yard waste** 10 tons/acre 13:1 (C:N)\*  |
| **Grafting**  | **None** ‘Skyway’ tomato (Johnny’s)  | **Yes** Splice grafting Scion: ‘Skyway’ tomato (Johnny’s) Rootstock: ‘Estamino’  |

**\*Please note: Residual compost treatment from previous pak choi trial (no application for this tomato trial)**

Participants were assigned to one block out of six total blocks in the high tunnel structure. Each block contained 16 plots that each received a different treatment. There were four treatments in total for the 2020-2021 tomato trial in Citra, FL. The research design was a split-split-split-split-plot design. The first split was the presence of a ‘iron and clay’ cowpea cover crop or no cover crop for each block. The next split level within the blocks were two different kinds of fertilizers, granular fertilizer or liquid fertigation. The granular fertilizer applied was Natursafe 10-2-8 at a total rate of 260 pounds of nitrogen per acre and 50 pounds of nitrogen per acre at transplanting. The fertilizer side dressing was applied every four weeks. The liquid fertigation 5-1-1 included application of sulfate of potash to match potassium with the granular fertilizer rate. The third split within each block was four different kinds of legacy compost treatments: (1) none, (2) cow manure, (3) vermicompost and (4) yard waste. The were no compost applications in this tomato trial. The rates of each legacy compost treatment described here are from the previous pak choi trial in the high tunnel. The cow manure was applied in the previous trial at a rate of 10 tons per acre with a 14 to 1 carbon to nitrogen ratio. The vermicompost was applied in the previous trial at a rate of 2.5 tons per acre with a 12 to 1 carbon to nitrogen ratio. The yard waste was applied in the previous trial at a rate of 10 tons per acre with a 13 to 1 carbon to nitrogen ratio. The final split within each block was whether or not the plants were grafted. The tomatoes were grafted using a splicing technique. The rootstock used was the Estamino variety and the tomato plants in the trial were the Skyway variety. The seeds were provided by Johnny’s Selected Seeds.

**2021-2021 High Tunnel Timeline:**

7/10/20: Half of the high tunnel was planted with a cowpea cover crop and the rest remained fallow.

9/1/20: Cowpea was mowed and incorporated into the soil.

9/11/20: Pak choi was transplanted into all plots.

10/16/20: Final pak choi harvest.

10/20/20: Direct seeded lettuce into all plots.

12/2/20: Final lettuce harvest.

12/10/20: Tomato seedlings transplanted into plots.

3/29/21: First tomato harvest.

5/27/21: Final tomato harvest.

|  |  |  |  |
| --- | --- | --- | --- |
| **Plot** | **Fertilization** | **Compost** | **Grafting** |
| 1 | Granular fertilizer | Cow manure | Yes |
| 2 | Granular fertilizer | Cow manure | No |
| 3 | Granular fertilizer | none | No |
| 4 | Granular fertilizer | none | Yes |
| 5 | Granular fertilizer | Yard waste | No |
| 6 | Granular fertilizer | Yard waste | Yes |
| 7 | Granular fertilizer | Vermicompost | Yes |
| 8 | Granular fertilizer | Vermicompost | No |
| 9 | Liquid fertigation | none | No |
| 10 | Liquid fertigation | none | Yes |
| 11 | Liquid fertigation | Yard waste | No |
| 12 | Liquid fertigation | Yard waste | Yes |
| 13 | Liquid fertigation | Vermicompost | Yes |
| 14 | Liquid fertigation | Vermicompost | No |
| 15 | Liquid fertigation | Cow manure | Yes |
| 16 | Liquid fertigation | Cow manure | No |

*Note*. The HT experiment was a randomized complete block design with six blocks total. Blocks I, III and V were planted with a cover crop. Blocks II, IV and VI were left fallow. The plot key above details the specific treatments in each plot. There was no compost applied in this tomato trial. The compost treatments indicated here for each plot were legacy compost treatments from the previous pak choi trial in the high tunnel.

**High performance treatments:**

* Liquid fertigation, cow manure, grafted
	+ Plot 15 (3 high performance choices, no low performance choices)
* Granular fertilizer, yard waste, grafted
	+ Plot 6 (3 high performance choices, 1 low performance choice)

**Low performance treatments:**

* Liquid fertigation, yard waste, not grafted
	+ Plot 11 (4 low performance choices, 2 high performance choices)
* Granular fertilizer, vermicompost, not grafted
	+ Plot 8 (3 low performance choices, no high performance choices)

*Primary Factors in Determining Plot Performance*

Best Performing Criteria

* Plant and fruit vigor
* Lack of insect pest and disease pressure
* Number of fruit
* Fruit appearance (e.g., no scabbing)
* Size of fruit
* Amount of foliage
* Balance between number of fruit and amount of foliage
* Tall canopy height without being lanky
* Very little damage or scarring to stems
* Little stunting of leaves

Worst Performing Criteria

* Lacking canopy coverage
* Canopy height too short
* Canopy being too dense and inhibiting number of fruit
* Too little number of fruit
* Fruit size too small
* Canopy color indicating nutrient deficiency
* Leaf damage
* Leaf curl
* Fragile looking stem
* Visible whiteflies
* Insect pest damage
* More blooms than fruit
* Residue from fungicides applied

Most Important Factors Overall

* Good base
* Thick stem
* Optimal balance of foliage amount and fruit amount
* Number of fruit
* Size of fruit
* Number of blooms
* Good microclimate
* Good overall plant watering
* Healthy leaves
* Plant canopy with little disease
* Good fruit load that was uniformly shaped and a good size

*Insect Pest and Disease Observations*

 Participants reported very little insect pest and disease pressure. There were some whiteflies observed and one stink bug. Some damage to the plant was observed, but very little overall.

*Fertilization Regime*

 Comments about the liquid compared to the granular fertilizer centered around the liquid being more biologically efficient while the granular is more economically efficient. There was no relationship between fertilization regime and insect pest pressure because there was no significant pest pressure observed.

**Recommendations for Future Research**

*Treatments to Continue*

* All

*Treatments to Eliminate*

* None

*Treatments to Add*

* Compare crop performance of purchased fertilizers with own created fertilizers
* Effects of grafting
* Different rootstock varieties
* Treatment effects on soil pH

*Additional Data to Collect*

* Temperature differences at the edge of the tunnel versus the rest of the tunnel
* Determine a suitable rootstock for Florida
* Have participants all evaluate the same block and discuss

**Discussion**

 There were clear block differences among participants’ observations, indicating a potential cover crop effect. Three blocks out of six total only had one participant assigned to it, so this limits the ability to determine a cover crop effect. Also, participants noted that the plots located at the edges of the tunnel did not appear as healthy as the other plots, which could be attributed to these plants having more light exposure and experiencing higher temperatures. This likely affected participants’ choices regarding plot performance, which may have led to inconsistent performance observations from block to block.

There was limited insect pest and disease pressure observed. Participants believed the compost being residual from the previous pak choi trial likely impacted their observations. The only consistent treatment factor regarding plot performance was grafting. All the low performance choices were not grafted and all the high performance choices were grafted. Generally, participants expressed a strong interest in learning more about and implementing grafting. Participants agreed the grafted plants outperformed the non-grafted ones.