

EFAO HORTICULTURE 2020: Research Protocol

Organic Grafted Greenhouse Tomato Trials

Farmer-Researchers: Nathan and Victor Klassen, Nith Valley Organics - West

Research Priorities: Seed Production, Varietal Selection & Breeding; Disease Control

EFAO Contact: Sarah Hargreaves, sarah@efao.ca

Objective

To compare the yield of Caiman, various heirlooms and cherry tomatoes when they are grafted on different rootstock varieties and ungrafted controls.

Background

In 2019, Nathan and Victor participated in a multi-farm tomato grafting trial. That trial concentrated on the effect of one root stock (Estanimo) on (mostly) heirloom varieties, in protected culture. Their experience was an outlier, in that they saw no yield advantage from grafted tomatoes, but they used a greenhouse tomato variety (Caiman F1) as their scion. They also trialed other rootstocks that *did* provide an improvement, in particular Maxifort. However, they were light on replicates, partly because of concern that the growth patterns of different treatments would be sufficiently different that they could not share a row, and because they didn't have many rows to devote to the trial.

They learned that the growth patterns were similar enough to do multiple treatments in one row, so this year they are repeating with more replicates, more root stocks, and more varieties of scion. Furthermore, their supplier of Maxifort (Johnny's) is discontinuing that variety, and other suppliers seem only to provide it as treated seed and, therefore, unsuitable for organic production. An important element of the trial will be gaining experience with Johnny's substitute for Maxifort: Shin Cheong Gang. Our hope with the Caiman trials is to have statistically meaningful results due to the use of randomly blocked replicates, across the available range of root stocks.

New to the farm is protected culture of grafted cherry tomatoes and grafted heirlooms – or tomatoes bred to appeal to customers looking for the heirloom look and favour and grown by farmers looking for modern hybrid performance (Granadero, Cherokee Carbon F1, Damsel F1 and Striped German). (In the past they've grown these ungrafted in protected culture). Where others have found improvements from grafting cherry tomatoes and heirlooms, they are looking to see what rootstocks perform well for them. Resources (time and greenhouse space) dictate that this portion of the trial cannot be as thorough as for Caiman, but they're hoping to get meaningful results, which might need further investigation in subsequent seasons.

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Experimental Design

Table 1. Design for large tomatoes.

Scion	Root stock (all meet organic standards)				Control	Total # plants	Design
	Estanimo	DR0141T X	Fortanimo	Shin Cheong Gang	Ungrafted		
Caiman F1	9 x 4 reps = 36	9 x 4 reps = 36	9 x 4 reps = 36	10 x 4 reps = 40	9 x 4 reps = 36	184	Randomized complete block design with 4 replicates*
Cherokee Carbon F1	4	0	4	4	6	18	**
Granadero F1	8	8	0	8	6	30	
Striped German	0	4	4	4	6	18	
Damsel F1	4	0	4	4	6	18	

*Treatments will be randomized across replicates to reduce the effect of location within the greenhouse.

** With the small numbers of each other variety, the best we can hope for is qualitative results. If it turns out that one rootstock outperforms the others across the range of scions that would allow us to treat the different scions as replicates.

Table 2. Design for cherry tomatoes. *See footnote for notes on the analysis.

Scion	Root stock (all meet organic standards)				Control	Total # plants
	Estanimo	DR0141TX	Fortanimo	Shin Cheong Gang	Ungrafted	
Five Star F1	9	9	9	9	9	45
Toronjina F1	9	9	9	9	9	45
Bartelli F1	9	9	9	9	9	45
Sakura F1	9	9	9	9	9	45

* With 9 plants per treatment, there aren't enough for proper replicates. Nathan and Victor will randomize the locations of each scion; if the scions grow similarly, they can treat the scions as replicates. This will

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allow them to test the efficacy of different rootstocks on cherry tomatoes in general, but not to evaluate the response of individual cherry varieties.

Research Plan

Time	Task	Methods & Measurements or Action Item
February	Seeding	
Early March	Grafting	A few weeks after seeding
Late April/early May	Transplant	In heated greenhouse, according to design above
Late July - end of October	Harvest	<ul style="list-style-type: none"> • 3x / week • Weigh the marketable fruit on a per- block basis • Last year they also measured every plant for one block for two weeks in mid-season to gain an estimate on plant-to-plant variability. They may do that again this year, if time permits.
October 31	Submit data and photos	Submit data and photos to Sarah/Rebecca
Before December 1	Invoice	Send Sarah invoice for farmer-fee and receipts for pre-approved research expenses

Materials

Please list all the equipment that you need for this project. Indicate “in-kind” under Total Cost for any materials that you already own or have access to. For pre-approved research expenses, for which you will be reimbursed, please indicate cost.

Material	Quantity Required	Total Cost*
Seed	430 (for 75% success rate)	~ \$200
Grafting clips		\$40
Potting mix		In-kind
Trays, strings, hooks and stakes		In-kind
Total		~\$240

* For approved research expenses

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Farmer-fee: \$500, invoiced to EFAO after farmer-researchers submit data.

Memorandum of Understanding

Farmer-researchers agree to keep an active membership with EFAO throughout the duration of their trial. Reimbursement for research expenses and farmer-fees will be paid to current members only.

Please also refer to efao.ca/farmer-led-research for a **Memorandum of Understanding** of other responsibilities. Specifically refer to sections:

- *What is expected of me as a farmer-researcher?*
- *What support will I receive from EFAO as a farmer-researcher?*

To check the status of your membership, log in here:

<https://efao.z2systems.com/np/clients/efao/login.jsp> or contact Martina, martina@efao.ca.