Healthy Food, Diverse Farms, Vibrant Communities

Heirloom Tomato Grafting

Cooperator

Andrew Dunham

Project Timeline

April through September 2009

Web Link

www.practicalfarmers.org/resources

Contact

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Funding

Leopold Center for Sustainable Agriculture and The Ceres Foundation

Abstract

Heirloom tomatoes are in high demand in local food markets and bring in a premium price. However, heirloom tomatoes often are disease prone and can produce inconsistent yields, reducing their reliability and efficiency for many growers.

The trial compared heirloom tomato variety Cherokee purple to Cherokee purple grafted to Maxifort. Maxifort is a rootstock that has good disease resistance and high vigor.

Non-grafted tomatoes yielded higher overall than the grafted tomatoes. Grafted tomatoes showed good yield potential before frost. The cool growing season caused late and low yields for all tomatoes on the participating farm in 2009.

Background

Heirloom tomatoes are in high demand in local food markets and bring in a premium price. However, heirloom tomatoes often are disease prone and can produce inconsistent yields, reducing their reliability and efficiency for many growers. Tomato plants that expressed more disease tolerance and fruit uniformity while preserving fruit quality and the unique character of heirloom varieties would provide a more consistent product for market and more stability for farmers' incomes.

Method

This research project examined the potential for grafted tomatoes to decrease the presence of disease and increase yield for heirloom tomatoes in Iowa. Grafting has been a useful cultural practice for fruit and vegetable growers, especially for perennial crops such as fruit trees. However, tomato grafting is a fairly new concept in the United States, although it is quickly gaining in popularity. Johnny's Selected Seeds is promoting grafting tomatoes, and *Growing for Market* recently featured farmers who graft tomatoes. Trials that have been conducted show potential for grafted heirloom tomatoes to have less soilborne disease occurrence and often higher yields (http://www4.ncsu.edu/~clrivard/TubeGraftingTechnique.pdf).

This trial compared heirloom tomato variety Cherokee purple to Cherokee purple grafted to Maxifort. Maxifort is a rootstock that has good disease resistance and high vigor. Grafting was conducted on the farm's facilities, using the grafting technique outlined in North Carolina Cooperative Extension Service's bulletin AG-675 "Grafting for Disease Resistance in Heirloom Tomatoes."

Figure 1. Andrew Dunham inspects newly transplanted grafted Cherokee purples.

Tomato plots were set up as shown in Table 1. Data collection consisted of sorting ripe fruit (at least 30% color) into marketable and cull categories. Number of fruit and weight were determined for each category. Cull fruit were defined as fruit <1½ inch in diameter, and those with rots, radial cracks >1-inch, and concentric cracks and ripening disorders over more than 5% of the fruit surface. Harvest window and plant health were recorded. Plants were monitored for disease.

Farm Cooperator

Andrew Dunham and his wife, Melissa, operate Grinnell Heritage Farm. Andrew is the fifth generation on the family farm. They raise certified organic vegetables, flowers, and herbs for sale through community supported agriculture, farmer's markets, and grocery stores.

Results

Andrew Dunham was one of three initial cooperators for this project. His tomatoes were the only ones to make it to the field. The other two cooperators did not have a good survival rate with the grafted plants. Their experience emphasized the importance of planting the rootstock and

scion at appropriate times and using correct grafting techniques following a set grafting schedule.

The day after Andrew grafted his tomatoes, all plants looked healthy. Three days after, all but five looked dead, but many perked back up. In the end, 45 out of 80 grafts were successful, for a 56% survival rate. Andrew said the grafting process was straightforward, and the most difficult aspect was getting the diameter of the rootstock to match that of the scion. Andrew: "Tomato grafting is one of the weirdest things I have ever done. It was living performing tomato surgery."

For Andrew, two weeks was not enough time for the grafted plants to heal, as directed in North Carolina's grafting schedule. He held them indoors for four weeks before transplanting outside. Tomatoes were transplanted to the field June 3.

Grafted Cherokee purples had 70% of the yield of the non-grafted tomatoes. Grafted had a 24% cull rate and non-grafted had a 22% cull rate.

Tomato yields were relatively low in both trials (total yield data taken from 24 plants for each method). Andrew remarked that he had low yields across all of his tomato plantings this year. There was very little disease pressure on either the grafted or non-grafted plants.

According to Johnny's Selected Seeds, Maxifort is a vigorous rootstock that should be used for greenhouse tomatoes. Johnny's states it should not be used for heirloom tomatoes because it will produce vegetative growth at the expense of fruit production. Andrew observed that his grafted plants had roughly twice as much vegetative growth as the non-grafted plants. Johnny's recommends Beaufort as a rootstock for heirloom tomatoes.

Cary Rivard, North Carolina State University, doesn't fully agree with Johnny's recommendations: "We have seen Maxifort produce better than Beaufort, especially in the case of Cherokee purples. Although all rootstocks tend to delay the first harvest a little bit, Maxifort is probably the most guilty party at this."

Andrew Dunham: "In our experience it was a bad tomato year. We didn't start to get a decent yield until late August, and had an early frost. Even my ungrafted Cherokees didn't perform, and the grafted plants were twice as tall as the non-grafted at frost."

There were a lot of green tomatoes on all plants at frost, and the non-grafted tomatoes had a lower harvest the last three weeks of the season than the grafted tomatoes. Spring was cool in 2009 with mild summer temperatures and an early first frost date. A traditionally warmer season may have provided more data sets.

Conclusions

More trials need to be conducted in order to determine if tomato grafting is a promising tool for increasing reliability and yield in heirloom tomatoes for Iowa farmers. Are you interested in having this project repeated in 2010? If so, contact Sally at (515)232-5661, sally@practicalfarmers.org.

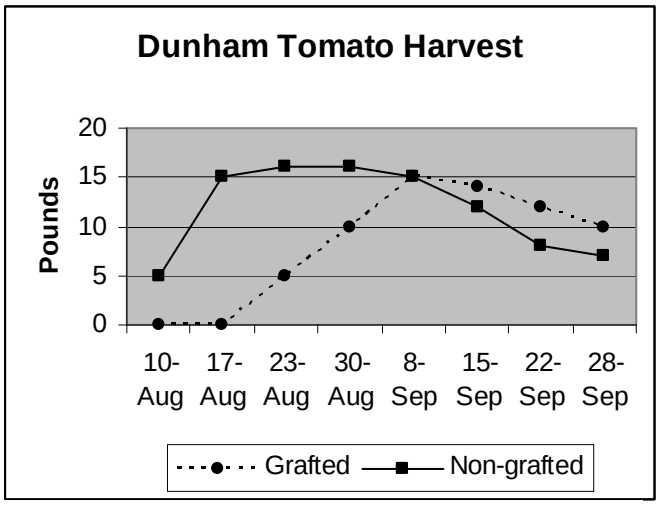

Chart 1. Harvest and yield.

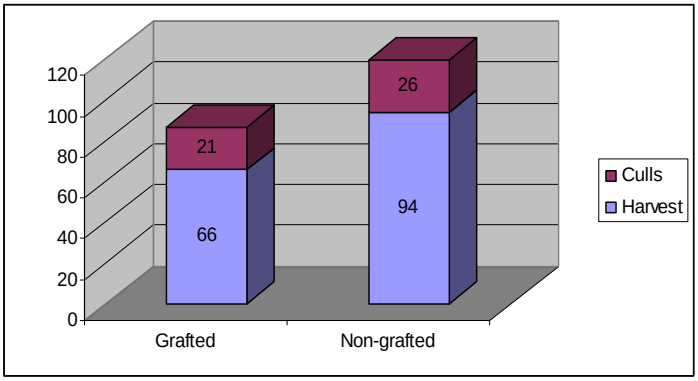

Chart 2. Season yield totals.

1st row	2 nd row	3rd row	4th row
Guard	Guard-G	Guard-H	Guard
Guard	G	H	Guard
Guard	G	H	Guard
Guard	G	H	Guard
Guard	G	H	Guard
Guard	G	H	Guard
Guard	G	H	Guard
Guard	G	H	Guard
Guard	G	H	Guard
Guard	Guard-G	Guard-H	Guard
Guard	Guard-H	Guard-G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
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Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	Guard-H	Guard-G	Guard
Guard	Guard-H	Guard-G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	H	G	Guard
Guard	Guard-H	Guard-G	Guard

Table 1. Tomato grafted (G) versus heirloom (H) trial design.

Report prepared February 2010