Overview
WSU Master Gardener Volunteer Education Program
Working with Youth

On the Road Tours
WSU Master Gardener Plant Clinic

Master Gardener Foundation
Clark County Master Gardener Endowment

Tomato Yield and Late Blight Study: Condensed Version
Dr. Carol A. Miles, Kathryn Kolker, Gail Becker, Martin Nicholson, Washington State University, Vancouver Research and Extension Unit, and Tom Koskinen, Master Gardener, Washington State University, Clark County Extension

Introduction. Late blight disease is a primary concern for organic tomato growers in Washington. It is caused by *Phytophthora infestans*, an organism that thrives in moist conditions and infects tomatoes, potatoes and other members of the *Solanaceae* family. The disease causes decreased fruit production, overall decline in plant health, and eventual plant death. The disease can be identified by dark lesions accompanied by white mold-like growth on the leaves, stem, and fruit.

In 2004, a group of Clark County Master Gardeners conducted a research trial in collaboration with Dr. Carol Miles at Washington State University Vancouver Research and Extension Unit. The purpose of the study was to evaluate a number of tomato varieties for their tolerance to late blight. The trial included 35 varieties and 10 breeding lines. Yield, time to first harvest, and tolerance to late blight were measured. Tom Koskinen, Master Gardener, oversaw harvest and data collection.

Methods. Tomatoes were seeded in the greenhouse on March 8, 2004, and were transplanted into the field on May 24. One variety, Green Zebra, was seeded March 26 due to late seed arrival. The field was certified organic and managed accordingly. Rows were mulched with black plastic and drip irrigated. A clover cover crop was sown between the rows and was mowed as needed with a lawn mower from July through September. Tomato harvest began August 17 and continued once a week until September 21. The fruit was hand harvested and total fruit number, total fruit weight, average fruit weight, and average fruit diameter were measured. At the end of the harvest season, on September 27, plots were visually evaluated for late blight by assessing the percent greenness of whole plants (leaves and stems) in each plot. At this time, all plants in the field had been exposed to a natural infestation of late blight, and symptoms were extreme on many varieties, that is, plants in some plots were dead or nearly dead.

Results. Results from this study showed significant differences in overall yields among different varieties (see Table 1). Of the slicer varieties, ‘Jet Star’, ‘Mountain Delight’, and ‘Beefmaster’ produced the highest yields (lbs/plant), while the heaviest fruit was produced by ‘Brandywine’ (9.42 oz) and ‘Beefmaster’ (8.22 oz). The largest diameter fruit was produced by ‘Beefmaster’ (3.57 in), ‘Brandywine’ (2.88 in), and ‘Celebrity’ (2.85 in). Of the cherry varieties, ‘Gold Nugget’ produced the highest yields, while ‘Red Cherry’ (0.68 oz, 1.29 in), ‘Gold Nugget’ (0.41 oz, 1.07 in), and ‘Sweet Million Cherry’ (0.38 oz, 1.09 in) produced the heaviest and largest diameter fruit. Of the plum varieties, ‘Juliet’ (5.24 lbs/plant) and ‘San Marzano’ (4.67 lbs/plant) produced the largest yields, while ‘Quimbaya’ produced the largest fruit (2.61 oz, 2.03 in).

Cherry tomato varieties had the highest level of tolerance to late blight, especially ‘Red Currant’, ‘Sungold’ and ‘Peace Vine Cherry’.
However, 'Red Currant' produced the smallest yields of all cherry tomato varieties (1.55 lb/plant), and among the smallest yields overall. Small yields of this variety were due to its extremely small fruit size (0.08 oz, 0.56 in). Three of the four plum tomato varieties grown in this study also showed tolerance to late blight: ‘San Marzano’, ‘Black Plum Paste’, and ‘Quimbaya.’ Of the standard slicer tomato varieties, ‘Brandywine’ and ‘Bradley Pink’ showed the highest levels of tolerance, but neither of the varieties showed good tolerance (greater than 60% green foliage at the end of the growing season). Except for the plum tomato variety ‘San Marzano,’ varieties that showed late blight tolerance produced lower than average yields.

Discussion and Conclusions. A positive correlation between late blight tolerance and total yield was expected. However, the opposite was the case. Varieties that produced larger yields tended to be less tolerant to late blight, and varieties that produced smaller yields tended to be more tolerant. These results indicate that in this study late blight may not have significantly affected the relative overall yield of different varieties. This was likely due to the late onset of the disease in 2004.

For more details, including taste comments and photographs of all the tomato varieties trialed, read Tomato Trial Varieties (http://clark.wsu.edu/volunteer/mg/gm_tips/TomatoTrialVarieties.html).

Table 1. Yield, average fruit weight, days to harvest, and seed supplier of tomatoes grown at WSU VREU in 2004.

<table>
<thead>
<tr>
<th>Slicer Tomato Variety</th>
<th>Yield per plant (lb)</th>
<th>Fruit weight (oz)</th>
<th>Days to Harvest</th>
<th>Seed Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beefmaster</td>
<td>9.56</td>
<td>8.22</td>
<td>80</td>
<td>Lilly Miller</td>
</tr>
<tr>
<td>Bradley Pink</td>
<td>4.70</td>
<td>4.21</td>
<td>74</td>
<td>Lilly Miller</td>
</tr>
<tr>
<td>Brandywine</td>
<td>4.70</td>
<td>4.21</td>
<td>74</td>
<td>Lilly Miller</td>
</tr>
<tr>
<td>Caro Rich</td>
<td>3.46</td>
<td>4.35</td>
<td>75-80</td>
<td>Lilly Miller</td>
</tr>
<tr>
<td>Celebrity</td>
<td>7.15</td>
<td>4.42</td>
<td>70</td>
<td>Lilly Miller</td>
</tr>
<tr>
<td>Delicious</td>
<td>7.35</td>
<td>5.41</td>
<td>65</td>
<td>Territorial Seed</td>
</tr>
<tr>
<td>Early Cascade</td>
<td>5.98</td>
<td>2.37</td>
<td>65</td>
<td>Lilly Miller</td>
</tr>
<tr>
<td>Early Girl</td>
<td>5.72</td>
<td>3.27</td>
<td>70</td>
<td>Territorial Seed</td>
</tr>
<tr>
<td>Fantastic</td>
<td>7.43</td>
<td>4.03</td>
<td>65</td>
<td>Territorial Seed</td>
</tr>
<tr>
<td>Green Zebra</td>
<td>3.42</td>
<td>2.20</td>
<td>72</td>
<td>Tomato Grower’s Supply</td>
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<td>High Carotene</td>
<td>4.89</td>
<td>1.30</td>
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<tr>
<td>Homestead</td>
<td>5.00</td>
<td>3.66</td>
<td>72</td>
<td>Totally Tomatoes</td>
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<tr>
<td>Jet Star</td>
<td>9.78</td>
<td>4.54</td>
<td>65</td>
<td>Harris Seeds</td>
</tr>
<tr>
<td>Legend</td>
<td>6.81</td>
<td>3.60</td>
<td>65</td>
<td>Territorial Seed</td>
</tr>
<tr>
<td>Lemon Boy</td>
<td>3.62</td>
<td>2.24</td>
<td>80</td>
<td>Lake Valley Seeds</td>
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<tr>
<td>Manitoba</td>
<td>7.84</td>
<td>2.45</td>
<td>79</td>
<td>Territorial Seed</td>
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<tr>
<td>Mountain Delight</td>
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<tr>
<td>Mountain Fresh</td>
<td>6.02</td>
<td>4.61</td>
<td>70-80</td>
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<tr>
<td>Mountain Pride</td>
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<td>3.85</td>
<td>70-80</td>
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<td>Mountain Spring</td>
<td>6.25</td>
<td>4.85</td>
<td>70-80</td>
<td>Totally Tomatoes</td>
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<tr>
<td>Northern Delight</td>
<td>6.45</td>
<td>1.21</td>
<td>58</td>
<td>Territorial Seed</td>
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<tr>
<td>Seattle Best</td>
<td>6.29</td>
<td>2.66</td>
<td>72</td>
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<tr>
<td>Stupice</td>
<td>4.78</td>
<td>1.82</td>
<td>70-80</td>
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<td>Yellow Perfection</td>
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<td>1.27</td>
<td>70-75</td>
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<table>
<thead>
<tr>
<th>Cherry Tomato Variety</th>
<th>Yield per plant (lb)</th>
<th>Fruit weight (oz)</th>
<th>Days to Harvest</th>
<th>Seed Supplier</th>
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<tbody>
<tr>
<td>Gold Nugget</td>
<td>6.85</td>
<td>0.41</td>
<td>51</td>
<td>Territorial Seed</td>
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<tr>
<td>Peace Vine</td>
<td>2.21</td>
<td>0.23</td>
<td>70-80</td>
<td>Seeds of Change</td>
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<td>Red Cherry</td>
<td>2.69</td>
<td>0.68</td>
<td>65</td>
<td>Lilly Miller</td>
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<tr>
<td>Red Currant</td>
<td>1.55</td>
<td>0.08</td>
<td>65</td>
<td>Seeds of Change</td>
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<td>Sungold</td>
<td>3.26</td>
<td>0.33</td>
<td>58</td>
<td>Shepherd’s Garden Seeds</td>
</tr>
<tr>
<td>Sweet Million</td>
<td>2.50</td>
<td>0.38</td>
<td>60</td>
<td>Territorial Seed</td>
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</table>

<table>
<thead>
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<th>Plum Tomato Variety</th>
<th>Yield per plant (lb)</th>
<th>Fruit weight (oz)</th>
<th>Days to Harvest</th>
<th>Seed Supplier</th>
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<td>Black Plum Paste</td>
<td>3.65</td>
<td>0.96</td>
<td>75-80</td>
<td>Lilly Miller</td>
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<td>Juliet</td>
<td>5.24</td>
<td>0.87</td>
<td>60</td>
<td>Johnny’s</td>
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<tr>
<td>Quimbaya</td>
<td>3.70</td>
<td>2.61</td>
<td>80</td>
<td>Totally Tomatoes</td>
</tr>
<tr>
<td>Variety</td>
<td>Yield 1</td>
<td>Yield 2</td>
<td>Yield 3</td>
<td>Seed Source</td>
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<td>------------</td>
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<tr>
<td>San Marzano</td>
<td>4.67</td>
<td>1.45</td>
<td>80</td>
<td>Lake Valley Seeds</td>
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</tbody>
</table>

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Overview
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Tomato Trial Varieties

Slicer Tomato Varieties

**Beefmaster**
Days to Harvest: 80
Avg. Fruit Size: 3.57 in.
Avg. Fruit Wt: 8.22 oz.
Yield: 9.56 lb/plant
Indeterminate
Our Flavor Comments: A bit bland, mild tomato flavor
Seed Supplier: Lilly Miller

**Bradley Pink**
Days to Harvest: 74
Avg. Fruit Size: 2.34 in.
Avg. Fruit Wt: 4.21 oz.
Yield: 4.70 lb/plant
Indeterminate
Our Flavor Comments: Sweet, flavorful, juicy
Seed Supplier: Lilly Miller

**Brandywine**
Days to Harvest: 79
Avg. Fruit Size: 2.88 in.
Yield: 4.06 lb/plant
Indeterminate
Our Flavor Comments: Bland with a touch of sweetness; meaty texture
Seed Supplier: Lilly Miller
Caro Rich
Days to Harvest: 75-80
Avg. Fruit Size: 2.39 in.
Avg. Fruit Wt: 4.35 oz.
Yield: 3.46 lb/plant
Indeterminate
Our Flavor Comments: Sour, mealy; good when dried
Seed Supplier: Lilly Miller

Celebrity
Days to Harvest: 70
Avg. Fruit Size: 2.85 in.
Avg. Fruit Wt: 4.42 oz.
Yield: 7.15 lb/plant
Indeterminate
Our Flavor Comments: Good texture, slightly citrus flavor with an aftertaste of sweetness
Seed Supplier: Lilly Miller

Delicious
Days to Harvest: 65
Avg. Fruit Size: 2.71 in.
Avg. Fruit Weight: 5.41 oz.
Yield: 7.35 lb/plant
Indeterminate
Our Flavor Comments: n/a
Seed Supplier: Territorial Seed Company

Early Cascade
Days to Harvest: 65
Avg. Fruit Size: 1.97 in.
Avg. Fruit Wt: 2.37 oz.
Yield: 5.98 lb/plant
Indeterminate
Our Flavor Comments: Mild tomato flavor
Seed Supplier: Lilly Miller

Early Girl
Days to Harvest: 70
Avg. Fruit Size: 2.23 in.
Avg. Fruit Weight: 3.27 oz.
Yield: 5.72 lb/plant
Indeterminate
Our Flavor Comments: Sweet, juicy and firm; very good flavor
Seed Supplier: Territorial Seed Company

Fantastic
Days to Harvest: 65
Avg. Fruit Size: 2.23 in.
Avg. weight: 4.03 oz.
Yield: 7.43 lb/plant
Indeterminate
Our Flavor Comments: Good, juicy, mild with a sweet aftertaste
Seed Supplier: Territorial Seed Company

Green Zebra
Days to Harvest: 72
Avg. Fruit Size: 2.77 in.
Avg. Fruit Weight: 2.20 oz.
Yield: 3.42 lb/plant
Determinate
Our Flavor Comments: Juicy, tart and slightly acidic
Seed Supplier: Tomato Grower Supply

High Carotene
Days to Harvest: 65
Avg. Fruit Size: 1.80 in.
Avg. weight: 1.30 oz.
Yield: 4.89 lb/plant
Indeterminate
Our Flavor Comments: Mildly sweet, juicy, pleasant
Seed Supplier: Territorial Seed Company

Homestead
Days to Harvest: 72
Avg. Fruit Size: 2.24 in.
Avg. Fruit Weight: 3.66 oz.
Yield: 5.00 lb/plant
Determinate
Our Flavor Comments: Bland, juicy, mildly acidic
Seed Supplier: Totally Tomatoes
Jet Star
Days to Harvest: 65
Avg. Fruit Size: 2.64 in.
Avg. Fruit Weight: 4.54 oz.
Yield: 9.78 lb/plant
Our Flavor Comments: Acidic with sweet undertones
Indeterminate
Seed Supplier: Harris Seeds

Legend

Lemon Boy
Days to Harvest: 80
Avg. Fruit Size: 2.00 in.
Avg. Fruit Weight: 2.24 oz.
Yield: 3.62 lb/plant
Our Flavor Comments: n/a
Indeterminate
Seed Supplier: Lake Valley Seeds

Manitoba
Days to Harvest: 79
Avg. Fruit Size: 2.00 in.
Avg. Fruit Weight: 2.45 oz.
Yield: 7.84 lb/plant
Our Flavor Comments: Juicy, slightly tart (especially the skin)
Determinate
Seed Supplier: Territorial Seed Company

Mountain Delight
Days to Harvest: 78
Avg. Fruit Size: 2.43 in.
Avg. Fruit Weight: 4.71 oz.
Yield: 9.07 lb/plant
Our Flavor Comments: Slightly sweet, juicy, and firm; nice mild flavor
Determinate
Seed Supplier: Totally Tomatoes

Mountain Fresh
Days to Harvest: 70-80
Avg. Fruit Size: 2.18 in.
Avg. Fruit Weight: 4.61 oz.
Yield: 6.02 lb/plant
Our Flavor Comments: Acidic, firm, mild flavor
Determinate
Seed Supplier: Totally Tomatoes

Mountain Pride
Days to Harvest: 70-80
Avg. Fruit Size: 1.81 in.
Avg. Fruit Weight: 3.85 oz.
Yield: 7.78 lb/plant
Our Flavor Comments: Meaty, firm, very mild flavor
Determinate
Seed Supplier: Totally Tomatoes

Mountain Spring
Days to Harvest: 70-80
Avg. Fruit Size: 2.44 in.
Avg. Fruit Weight: 4.85 oz.
Yield: 6.25 lb/plant
Our Flavor Comments: Mild, firm, slightly acidic
Determinate
Seed Supplier: Totally Tomatoes

Northern Delight
Days to Harvest: 58
Avg. Fruit Size: 1.60 in.
Avg. Fruit Weight: 1.21 oz.
Yield: 6.45 lb/plant
Our Flavor Comments: Juicy, sour and sweet, flavorful
Determinate
Seed Supplier: Territorial Seed Company

Seattle Best
Days to Harvest: 72
Avg. Fruit Size: 2.17 in.

Stupice
Days to Harvest: 70-80
Avg. Fruit Size: 1.71 in.

Yellow Perfection
Days to Harvest: 70-75
Avg. Fruit Size: 1.66 in.
Cherry Tomato Varieties

Gold Nugget
- Days to Harvest: 51
- Avg. Fruit Size: 1.07 in.
- Avg. Fruit Weight: 0.41 oz.
- Yield: 6.85 lb/plant
- Our Flavor Comments: n/a
- Indeterminate
- Seed Supplier: Territorial Seed Company

Peace Vine
- Days to Harvest: 70-80
- Avg. Fruit Size: 0.88 in.
- Avg. Fruit Weight: 0.23 oz.
- Yield: 2.21 lb/plant
- Our Flavor Comments: n/a
- Indeterminate
- Seed Supplier: Seeds of Change

Red Cherry
- Days to Harvest: 65
- Avg. Fruit Size: 1.29 in.
- Avg. Fruit Weight: 0.68 oz.
- Yield: 2.69 lb/plant
- Our Flavor Comments: n/a
- Indeterminate
- Seed Supplier: Lilly Miller

Red Currant
- Days to Harvest: 65
- Avg. Fruit Size: 0.56 in.
- Avg. Fruit Weight: 0.08 oz.
- Yield: 1.55 lb/plant
- Our Flavor Comments: n/a
- Indeterminate
- Seed Supplier: Seeds of Change

Sungold
- Days to Harvest: 58
- Avg. Fruit Size: 1.01 in.
- Avg. Fruit Weight: 0.33 oz.
- Yield: 3.26 lb/plant
- Our Flavor Comments: n/a
- Indeterminate
- Seed Supplier: ShepherdÕs Garden Seeds

Sweet Million
- Days to Harvest: 60
- Avg. Fruit Size: 1.09 in.
- Avg. Fruit Weight: 0.38 oz.
- Yield: 2.50 lb/plant
- Our Flavor Comments: n/a
- Indeterminate
- Seed Supplier: Territorial Seed Company

Plum Tomato Varieties

Black Plum
- Days to Harvest: 75-80
- Avg. Fruit Size: 1.27 in.
- Avg. Fruit Weight: 0.96 oz.
- Yield: 3.65 lb/plant
- Our Flavor Comments: A bit
- Indeterminate
- Seed Supplier: Johnny’s

Juliet
- Days to Harvest: 60
- Avg. Fruit Size: 1.13 in.
- Avg. weight: 0.87 oz.
- Yield: 5.24 lb/plant
- Our Flavor Comments: n/a
- Indeterminate
- Seed Supplier: Johnny’s

Quimbaya
- Days to Harvest: 80
- Avg. Fruit Size: 2.03 in.
- Avg. Fruit Weight: 2.61 oz.
- Yield: 3.70 lb/plant
- Our Flavor Comments: Very firm and mild
- Indeterminate
bland, mild tomato flavor
Seed Supplier: Lilly Miller

Seed Supplier: Totally Tomatoes

San Marzano
Days to Harvest: 80
Avg. Fruit Size: 1.59 in.
Avg. Fruit Weight: 1.45 oz.
Yield: 4.67 lb/plant
Our Flavor Comments: Mealy, firm, bland
Indeterminate
Seed Supplier: Lake Valley Seeds

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