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Garden Mastery Tips

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June 2005

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) (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.

| Slicer Tomato Variety | Yield per plant (lb) | Fruit weight (oz) | Days to Harvest | Seed Supplier |
|-----------------------|----------------------|-------------------|-----------------|-------------------------------|
| Beefmaster | 9.56 | 8.22 | 80 | Lilly Miller |
| Bradley Pink | 4.70 | 4.21 | 74 | Lilly Miller |
| Brandywine | 4.70 | 4.21 | 74 | Lilly Miller |
| Caro Rich | 3.46 | 4.35 | 75-80 | Lilly Miller |
| Celebrity | 7.15 | 4.42 | 70 | Lilly Miller |
| Delicious | 7.35 | 5.41 | 65 | Territorial Seed |
| Early Cascade | 5.98 | 2.37 | 65 | Lilly Miller |
| Early Girl | 5.72 | 3.27 | 70 | Territorial Seed |
| Fantastic | 7.43 | 4.03 | 65 | Territorial Seed |
| Green Zebra | 3.42 | 2.20 | 72 | Tomato Grower's Supply |
| High Carotene | 4.89 | 1.30 | 65 | Territorial Seed |
| Homestead | 5.00 | 3.66 | 72 | Totally Tomatoes |
| Jet Star | 9.78 | 4.54 | 65 | Harris Seeds |
| Legend | 6.81 | 3.60 | 65 | Territorial Seed |
| Lemon Boy | 3.62 | 2.24 | 80 | Lake Valley Seeds |
| Manitoba | 7.84 | 2.45 | 79 | Territorial Seed |
| Mountain Delight | 9.07 | 4.71 | 78 | Totally Tomatoes |
| Mountain Fresh | 6.02 | 4.61 | 70-80 | Totally Tomatoes |
| Mountain Pride | 7.78 | 3.85 | 70-80 | Totally Tomatoes |
| Mountain Spring | 6.25 | 4.85 | 70-80 | Totally Tomatoes |
| Northern Delight | 6.45 | 1.21 | 58 | Territorial Seed |
| Seattle Best | 6.29 | 2.66 | 72 | Territorial Seed |
| Stupice | 4.78 | 1.82 | 70-80 | Abundant Life Seed Foundation |
| Yellow Perfection | 3.92 | 1.27 | 70-75 | Seeds of Change |
| Cherry Tomato Variety | Yield per plant (lb) | Fruit weight (oz) | Days to Harvest | Seed Supplier |
| Gold Nugget | 6.85 | 0.41 | 51 | Territorial Seed |
| Peace Vine | 2.21 | 0.23 | 70-80 | Seeds of Change |
| Red Cherry | 2.69 | 0.68 | 65 | Lilly Miller |
| Red Currant | 1.55 | 0.08 | 65 | Seeds of Change |
| Sungold | 3.26 | 0.33 | 58 | Shepherd's Garden Seeds |
| Sweet Million | 2.50 | 0.38 | 60 | Territorial Seed |
| Plum Tomato Variety | Yield per plant (lb) | Fruit weight (oz) | Days to Harvest | Seed Supplier |
| Black Plum Paste | 3.65 | 0.96 | 75-80 | Lilly Miller |
| Juliet | 5.24 | 0.87 | 60 | Johnny's |
| Quimbaya | 3.70 | 2.61 | 80 | Totally Tomatoes |

San Marzano

4.67

1.45

80

Lake Valley Seeds

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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

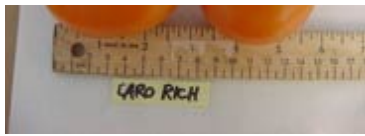
Days to Harvest: 74
Avg. Fruit Size: 2.34 in.
Avg. Fruit Wt: 4.21 oz.
Yield: 4.70 lb/plant
Indeterminate
Our Flavor Comments: Sweet,
flavorful, juicy
Seed Supplier: Lilly Miller



Brandywine

Days to Harvest: 79
Avg. Fruit Size: 2.88 in.
Avg. Fruit Wt: 9.42 oz.
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
 Our Flavor Comments: n/a
 Indeterminate
 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
 Our Flavor Comments: Sweet,
 juicy and firm; very good flavor
 Indeterminate
 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
 Our Flavor Comments: Good,
 juicy, mild with a sweet aftertaste
 Indeterminate
 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
 Our Flavor Comments: Juicy, tart
 and slightly acidic
 Determinate
 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
 Our Flavor Comments: Mildly
 sweet, juicy, pleasant
 Indeterminate
 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
 Our Flavor Comments: Bland,
 juicy, mildly acidic
 Determinate
 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

Days to Harvest: 65
 Avg. Fruit Size: 2.20 in.
 Avg. Fruit Weight: 3.60 oz.
 Yield: 6.81 lb/plant
 Our Flavor Comments: Mild flavor, slightly acidic
 Determinate
 Seed Supplier: Territorial Seed Company

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.

Avg. Fruit Size: 2.17 in.
 Avg. Fruit Weight: 2.66 oz.
 Yield: 6.29 lb/plant
 Our Flavor Comments: Juicy,
 sour, good flavor, slightly acidic
 Indeterminate
 Seed Supplier: Territorial Seed
 Company

Avg. Fruit Size: 1.71 in.
 Avg. Fruit Weight: 1.82 oz.
 Yield: 4.78 lb/plant
 Our Flavor Comments: Sweet,
 juicy, very good full flavor
 Indeterminate
 Seed Supplier: Abundant Life
 Seed Foundation

Avg. Fruit Size: 1.00 in.
 Avg. Fruit Weight: 1.27 oz.
 Yield: 3.92 lb/plant
 Our Flavor Comments: Sweet,
 smooth, good flavor
 Indeterminate
 Seed Supplier: Seeds of Change

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
 Determinate
 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

Photo Unavailable



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: Shepherd's
 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

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

Plum Tomato Varieties



Black Plum

Days to Harvest: 75-80
 Avg. Fruit Size: 1.27 in.
 Avg. Fruit Wt: 0.96 oz.
 Yield: 3.65 lb/plant
 Our Flavor Comments:
 Indeterminate
 Our Flavor Comments: A bit



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
 Determinate
 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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