

Tomato Yield and Late Blight Study: Condensed Version

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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://county.wsu.edu/clark/gardening/mg/Documents/TomatoTrialVarieties.pdf) (<http://county.wsu.edu/clark/gardening/mg/Documents/TomatoTrialVarieties.pdf>).

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	4.7	4.21	74	Lilly Miller
Brandywine	4.7	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	2.2	72	Tomato Grower's Supply
High Carotene	4.89	1.3	65	Territorial Seed
Homestead	5	3.66	72	Totally Tomatoes
Jet Star	9.78	4.54	65	Harris Seeds
Legend	6.81	3.6	65	Territorial Seed
Lemon Boy	3.62	2.24	80	Lake Valley Seeds
Manitoba	7.84	2.45	79	Territorial Seed

Slicer Tomato Variety	Yield per plant (lb)	Fruit weight (oz)	Days to Harvest	Seed Supplier
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	2.5	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	3.7	2.61	80	Totally Tomatoes
San Marzano	4.67	1.45	80	Lake Valley Seeds