

Final Report 2006
California Tomato Research Institute, Inc.

Project Title: Evaluation of Plant and Soil Treatments to Control Corky Root Rot

Project Leader:

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Objectives:

- 1) Establish field trials in grower production fields, which evaluate chemical treatments applied to the soil, fungicide treatments applied to the transplants, and varietal resistance (if available) for the control of corky root rot.
- 2) Compare disease incidence, severity, and its effect on yield performance between treated and untreated plants.

Summary:

Three field trials were established in grower fields with a history of corky root in western Fresno county, however only one was harvested for yield and scored for disease incidence on roots. This trial had the full complement of 10 treatments which included a deep soil application of Vapam several weeks prior to transplanting; transplant dips in low and high rates of 3 fungicides (Maxim, Quadris, and Topsin), Trichoderma beneficial fungi (Promot Plus), and a product from Eco-Cote Int'l (a waterproofing wood preservative and sealant fortified with capsaicin, an extract of chili peppers); and an untreated check. The other two trials had subsets of the 10 treatments. In general corky root incidence was low in these fields this past season.

Background:

Corky root rot is generally a problem in early tomato plantings under cool conditions, especially in fields with a long history of tomato production. The fungus, *Pyrenochaeta lycopersici*, survives for long periods in the soil as microsclerotia. Disease development is optimal at 60 to 68 degrees F. Tomato plants that are infected with corky root are stunted and slow growing. The disease does not kill plants, but may reduce yields. Roots of plants infected with corky root rot are distinctly corky, rather than smooth and supple. Extensive brown lesions, often arranged in bands with lengthwise cracking of the cortex, develop on the larger roots. The tips of infected older roots are pinched off. Small feeder roots may be completely decayed. Branches on mature plants may die back from the tips.

Currently a preplant treatment with metam sodium (Vapam) is sometimes used to reduce disease in the subsequent tomato crop in fields with a history of corky root and high populations of the fungus. Most often, nothing is done. Very few products are available for

testing and none are specifically designed for Corky Root Rot in tomatoes. Conversations with tomato plant breeders and local growers indicate that corky root resistance exists in varieties used in other tomato growing regions around the world and that varieties suitable for CA agriculture are close to being available for trial.

Procedures

Since corky root incidence and severity is so unpredictable, three trials were established between March 15 and April 15, 2006 in grower production fields on the Westside of Fresno County in hopes that at least one would encounter significant disease pressure. All trials used transplants and were located in spots where corky root had previously occurred. Only one trial was taken to harvest. A list and description of the treatments and application rates are included in **Table 1**. Several weeks prior to planting (February 25, 2006) Vapam was applied at a depth of 12 inches to the center 2 feet of beds on a 60-inch center at a rate of 75 gal/treated acre. One hour before transplanting (April 13, 2006) the tomato seedlings were removed from transplant trays and the root balls were dipped in the fungicide/chemical solution for 10 seconds.

Plot size was 100 feet of a 60-inch bed and each treatment was replicated four times in a Randomized Complete Block Design. Disease incidence and any crop phytotoxicity was visually rated and objectively evaluated by digging the roots and scoring them for disease presence. The plots were machine harvested on August 28th and the roots were evaluated on the following day after being undercut about 15-inches from the soil surface. Approximately 50-100 roots were evaluated for each treatment plot. A rating scheme of 0-5 (0 = no disease, 5 = >50% disease) was used to score the tomato roots. A weighted frequency of the scores was averaged and analyzed. Fruit samples from the mechanical harvester were delivered to PTAB for analysis. The harvested field was grown using drip irrigation in the furrow. The variety was H 1650.

Table 1: Corky Root Treatments applied to seedling plants prior or at transplanting

	Treatments	Rate
1	Untreated	
2	Vapam HL (treated 2' of 5' bed)	75 gal/treated A
3	Quadris 25% F Low rate	0.1 lb a.i./100 gal
4	“ High rate	1.0 lb a.i./100 gal
5	Topsin M 4.5 FL Low rate	0.1 lb a.i./100 gal
6	“ High rate	1.0 lb a.i./100 gal
7	Maxim 4 FS Low rate	0.1 lb a.i./100 gal
8	“ High rate	1.0 lb a.i./100 gal
9	Promot Plus (Trichoderma)	2 ozs/gal
10	Eco Cote High rate	250 ml/gal

Table 2: Evaluation of plant and soil treatments to control Corky Root Rot in processing tomatoes transplanted April 13 and harvested August 28, 2006 - Fresno county

	Treatment	Yield T/A	*Root Rating	Color	°Brix	pH	50 fruit lbs	----- percent ----- red green sunburn rot
1	Untreated	51.2 b	1.1 b	23.8 ab	5.5	4.55	9.7	91.9 4.7 1.3 2.8
2	Vapam	55.8 ab	2.2 a	24.3 a	5.4	4.55	9.6	91.4 3.8 2.6 2.2
3	Quadris - Lo	57.6 a	1.2 b	23.0 ab	5.5	4.51	9.1	91.3 2.7 2.9 3.1
4	Quadris - Hi	53.1 ab	1.2 b	23.3 ab	5.4	4.59	11.0	93.6 2.8 1.1 2.5
5	Topsin M - Lo	56.2 ab	1.5 b	23.5 ab	5.4	4.57	9.5	92.8 3.4 0.3 3.6
6	Topsin M - Hi	55.1 ab	1.6 b	23.0 ab	5.5	4.54	9.4	93.0 2.2 1.7 3.2
7	Maxim - Lo	55.4 ab	1.4 b	23.3 ab	5.4	4.56	8.7	94.0 3.3 0.0 2.8
8	Maxim - Hi	54.4 ab	1.3 b	23.0 ab	5.3	4.55	8.9	90.7 3.4 1.2 4.7
9	Promot Plus	57.9 a	1.6 b	22.5 ab	5.4	4.53	9.2	92.5 3.5 0.4 3.7
10	Eco Cote - Hi	55.8 ab	1.4 b	22.3 b	5.5	4.55	9.1	92.6 2.5 0.6 4.2
	LSD (0.05)	5.3	0.6	1.8	NS	NS	1.3	NS 2.3 NS NS
	CV %	6.5	26.4	5.5	7.1	1.13	9.4	3.3 48.3 175.0 93.2
<p>* roots were undercut and sampled from each plot after harvest, scored into 6 infection level categories, and then reported as a weighted average.</p> <p>^{NS} no significant difference Results followed by same letter are not significantly different from each other.</p>								

Results:

Corky root incidence was not severe in this trial, although some incidence was apparent. Vines appeared healthy and the untreated plots did not stand out differently from the treated ones. There is concern that dipping transplants into strong or even weak concentrations of some fungicides could cause phytotoxicity to the young tomato plants, but no crop phytotoxicity was visibly observed from any of the treatments in any of these field plots, which were visited several times during the growing season (data not shown).

Table 2 summarizes the results of the corky root treatment applications. Yields ranged from 51.2 to 57.9 tons/acre. Two treatments (Quadris-low rate and Promot Plus) yielded significantly higher than the untreated check, although root disease ratings were not different from each other. Vapam showed more root symptoms than any of the other treatments including the untreated check. Color may also be affected by the Vapam treatment. Brix, pH, % red sunburn, and rotten fruit were not affected by the treatments. The untreated check averaged slightly more green fruit. More study is needed under higher corky root pressure before significant research conclusions can be drawn from these treatments.

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