

Report to Pennsylvania Vegetable Marketing and Research Program and Pennsylvania Vegetable Growers Association

Title: Report: Biological Control of Tomato Root Diseases 2011

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Introduction:

Root-borne diseases in tomatoes such as *Verticillium* and *Fusarium* can cause major losses in grower fields, high tunnels and greenhouses. As the squeeze to utilize as much land for profitable crops continues to increase, crop rotations become even more challenging. RootShield as well as other biological inoculants are showing great promise as tools to manage root-borne diseases even in less than ideal rotation schemes. In addition, several of these biological inoculants claim to increase nutrient uptake in a symbiotic relationship with tomato root systems. This project compared combinations of Rootshield, RootMate (together packaged as RSSI), Companion, Actinovate and Tall Harvest on tomato establishment, yield, and quality in two of the most popular red slicer tomatoes; Primo Red and Scarlet Red. The trial was held at the Penn State Southeast Research and Extension Center, Manheim (Landisville Farm).

After working with a vegetable grower client for several years that grows in-ground, greenhouse tomatoes that was experiencing annual bouts with *Verticillium*, we applied RootShield as a post planting drench. Even though the grower had used this soil for many years (15+) and had fumigated it annually, *Verticillium* returned until switching to preplant drenching with RootShield. Since this major change in root-borne disease management 6 years ago, they have seen no further plant collapse. This researcher has seen similar results in peppers, cut flowers and strawberries. Shifting growers to the increased use of inoculants for root and crown disease control has the potential to greatly increase profits across most vegetables and small fruit crops.

Objectives:

- Evaluate the biological inoculants Rootshield, RootMate, Companion, Actinovate, and Tall Harvest for their ability to control tomato root-borne diseases under field conditions.
- Evaluate the biological inoculants Rootshield, RootMate, Companion, Actinovate, and Tall Harvest for their ability to enhance nutrient uptake.
- Develop a set of recommendations for growers in order to facilitate adoption of biological inoculants if warranted to enhance disease control, yield and fruit quality.

Work Statement / Methodology:

Four replications of five plants of each of the two varieties (Primo Red and Scarlet Red) along with a water only control were planted on a raised-bed plasticulture system in late May 2011. All plants were trellised on a modified Florida weave system using new Oak stakes as line posts and metal "T" posts as end posts.

The fields was preplant fertilized based on nutrient management recommendations from preplant soil testing. Fungicide applications were protectant only using a combination of Chlorothalonil (Bravo), mancozeb and fixed coppers (Champ) in rotation. The manufacturers of these inoculants claim various degrees of plant defense stimulation, so no systemic fungicides were used in this program. Several of the materials technical data sheets claim benefits to a repeat application later in the growing season, these were done per the manufacturers published recommendations.

Once planted, nutrient injections and foliar nutrient applications were based on tissue analysis on a bi-weekly schedule. We tissue tested a composite sample of tomato petioles from each treatment and based our nutrient applications for all varieties on those results.

Results:

Just as in this same trial in 2010, as the first fruit was beginning to show color, Bacterial canker hit the plot full force. The disease apparently came in on the Primo Red plants as they were affected first. By the time the disease was noticed, the plants were in full flower and had been tied up several times which effectively spread the disease throughout the plots. Copper applications were somewhat effective in slowing the disease, but plant loss was indiscriminate across the plots. In order to limit the spread of the disease to this trial only (there were other tomato trials in the immediate vicinity), we destroyed the trial. No data of substance was collected prior to removing the trial. All plants were the same size including the water control.

Another research trial funded by the EPA doing similar work on strawberries has provided strong evidence that even without the presence of root-borne diseases, the mycorrhizal effect enhancing nutrient uptake is sufficient to encourage the adoption of specific biological inoculants. In a recent evaluation of Chandler strawberry plugs that came in infected with Anthracnose, there were substantial benefits in plant survival through the preplant inoculation with Companion in combination with Actinovate, Actinovate alone and the combination of Root Shield and Root Mate (labeled as RSSI).

A handwritten signature in black ink, appearing to read 'Steve Bogash', with a long, sweeping underline that extends to the right.

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Penn State Cooperative Extension