



Disease Management for Vegetable Crops

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Program Objectives

Optimize management of diseases affecting vegetables and herbs grown on Long Island within organic and conventional production systems by:

- studying pathogen biology, including sources.
- investigating fungicide resistance and impact on control.
- developing scouting protocols and action thresholds.
- evaluating control practices, including fungicides, resistant varieties, and integration of chemical and genetic control.

Examine impact on diseases of biofumigation with mustard cover crop and practices to improve soil health with focus on reduced tillage.

Diagnose disease problems for growers.



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Program Summary

The fungal pathogen that causes powdery mildew in cucurbits, which is the most important disease of this crop group, has proven itself adept at evolving to overcome management tools; therefore, to ensure management guidelines developed for growers are sound, efficacy of fungicides and resistant varieties, which are the only management tools for powdery mildew, needs to be examined regularly. Research conducted in 2014 included 1) testing registered conventional fungicides and experimentals; 2) examining fungicide sensitivity of the pathogen population in commercial and research fields, and its impact on disease control and management; and 3) determining fungicide sensitivity of pathogen isolates to currently registered products and fungicides in development.

Varieties and experimentals were evaluated with resistance to late blight in tomato, downy mildew in cucumber, and downy mildew in basil. Horticultural characteristics and resistance were assessed.

Fungicides were evaluated for downy mildew in basil and powdery mildew in tomato.

The Decision Support System for timing fungicide applications for late blight was evaluated for organically-produced tomato. It utilizes environmental conditions and other factors affecting this disease.

Biopesticides suitable for organic production were evaluated for downy mildew of basil and Phytophthora blight in pepper and acorn squash.

Organic copper fungicides were compared for efficacy, crop safety, residue, and mixing ability.

Results from evaluations are used to justify labeling for new products and to provide growers information on efficacy to assist with selection of registered products.

A sentinel plot was maintained for the national cucurbit downy mildew forecasting program.

A monitoring program was conducted for basil downy mildew and late blight in tomato.

Mustard biofumigation was used to manage Phytophthora blight.



Mustard cover crop before chopping and incorporating to biofumigate soil.

Program Justification

Powdery mildew is the most important disease affecting cucurbit crops every year throughout LI. Fungicide resistance is a major concern. A new strain of the cucurbit downy mildew pathogen occurring since 2004 has been causing more significant losses than previously. Cucurbits, especially pumpkin, are very important crops on LI. Late blight has been occurring every year on LI since 2009 especially impacting tomato in commercial fields and gardens. This change is associated with appearance in the US of new pathogen strains. Basil downy mildew is a new disease that has occurred in NY every year since 2008 in commercial field and greenhouse crops plus gardens. Biopesticides and copper fungicides are used for organic disease control. Recognized need for practices to improve soil health.

Impact to Industry

Research conducted in 2014 yielded information useful to growers producing vegetables and basil.

Research on efficacy of fungicides with targeted activity for cucurbit powdery mildew and sensitivity (resistance) of the pathogen to these fungicides added to the knowledge base about fungicide resistance in this pathogen. This information is needed to provide sound recommendations to growers about managing this disease with these fungicides. Currently-registered Quintec (FRAC Code 13) and Vivando (U6), a new fungicide that will be available to growers in 2015, were highly effective. Pristine (7 and 11) and Procure (3) were moderately effective likely reflecting resistance in the pathogen, therefore they are recommended used on a limited basis in rotation with the other fungicides. Pathogen isolates collected in September 2013 and tested in the laboratory were found to be resistant to Code 1 and 11 fungicides. Isolates varied in sensitivity to Code 3, 7, and 13 fungicides. Some were fully resistant to Code 7 and thus would not be controlled by Pristine. These were only found in commercial fields and research plots where Pristine was used, showing resistant strains can be selected for by using a fungicide over a season.

As a result of monitoring work, growers knew when important diseases were occurring on Long Island, and thus when fungicide applications were needed. This information also furthered knowledge about these diseases. Late blight again appeared early, but with knowledge of occurrences growers avoided devastating impact. Cucurbit downy mildew appeared very late and only affected cucumbers. 2014 was the worst year yet for basil downy mildew beginning with outbreaks in greenhouses in spring.

Downy mildew in field-grown basil was effectively controlled with conventional fungicides applied on a preventive schedule but not with organic fungicides although this program was done twice weekly. Effective resistance to this new disease was documented in crosses developed by breeders at Rutgers.

Late blight was much less severe in tomatoes bred to have the *Ph2* and *Ph3* resistance genes, compared to Mt. Fresh Plus, and also in other varieties (Pruden's Purple and Wapsipinicon Peach).

Late blight and other foliar diseases were effectively managed in tomato using the Decision Support System for timing copper applications. It scheduled 2 more sprays to a susceptible variety and 4 less to a moderately resistant one compared to a weekly, calendar-based program.

Phytophthora blight was controlled with targeted fungicides but not the biopesticides tested.

Program Team

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Foreground plants killed by Phytophthora blight; those behind protected by targeted fungicides.