Disease Management for Vegetable Crops

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Project Objectives:

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

- investigating pathogen biology, including sources.
- 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 practices to improve soil health: annual compost amendments, reduced tillage, and clover living mulch.

Diagnose disease problems for growers.

Determine impact of ambient ozone on plant productivity.

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Project 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 2010 included 1) evaluating 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; 3) determining fungicide sensitivity of pathogen isolates to currently registered products and fungicides in development; and 4) assessing performance of resistant varieties of melon, pumpkin, and squash (acorn, butternut, yellow summer and zucchini).

Varieties of tomato and experimentals with resistance to late blight were evaluated for yield and fruit quality as well as disease susceptibility.

Biopesticides were evaluated for managing downy mildew in organically-produced cucumber. A sentinel plot was maintained for the national downy mildew forecasting program.

Biopesticides also were evaluated for a new disease, downy mildew of basil.

Fungicides were evaluated for an old disease affecting a new host: Phytophthora blight of snap bean.

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

Heirloom tomatoes were evaluated for their susceptibility to foliar diseases as a component of a larger study that included evaluation of yield and fruit quality.

Impact on plant productivity of ambient ozone was examined by conducting research with a snap bean bioassay system developed to assess impact for a national research project.

Production of vegetables using reduced tillage was examined in research fields and on farms. A goal of this multi-disciplinary project is to examine impact of improving soil health on disease occurrence.

Laboratory assay to determine fungicide sensitivity of cucurbit powdery mildew isolates.

Project 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.

Ambient ozone reaches concentrations causing acute foliar injury to many crops each year on LI.

Recognized need for practices to improve soil health.

Basil downy mildew is a new disease in the US first observed in October 2007 in FL. It has occurred in NY every season since, affecting basil in commercial field and greenhouse crops plus gardens.

Impact to Industry:

Research conducted in 2010 generated information influencing management guidelines for 2011, most notably regarding cucurbit powdery mildew. Changes in the pathogen affecting control were documented. Resistant melon varieties exhibited moderate to poor suppression in 2010 contrasting with excellent control achieved previously. Mildew occurrence on melon differentials further documented change in the pathogen. Resistant squash and pumpkin varieties also exhibited moderate control at best as in recent years, thereby documenting this change in the pathogen detected previously is stable. Genetics of resistance in these crops is different from that in melons. Changes in sensitivity to key fungicides was also detected in the pathogen population. One of the 3 main recommended fungicides, Pristine, was ineffective for the first time in the annual fungicide evaluation. Pathogen strains resistant to its main active ingredient, boscalid, were detected in research and commercial fields much more commonly than in 2009. Resistance is conclusive because these strains tolerate a dose in assays (500 ppm) that is in the range of an application dose. Another recommended fungicide, Procure, was no longer effective at the last disease severity assessment while the third, Quintec, was highly effective. Pathogen adaptation to fungicides and resistant varieties is a major challenge to effectively managing this important disease.

Among 20 Heirloom tomato varieties evaluated, Brandywine had one of the highest severity ratings for Septoria leaf spot, the most common disease observed in organically-produced tomatoes in the region.

Maintaining a cucurbit downy mildew sentinel plot provided essential data for the forecasting program.

The web-based monitoring program for basil downy mildew proved useful for tracking and sharing information about its occurrence, and contributed to recognition of its importance in the US.

Project Team Members:

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Seedling bioassay to assess fungicide sensitivity of cucurbit powdery mildew pathogen populations.