# Disease Management for Vegetable Crops

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## Program 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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## 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 2011 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).

Fungicides were also evaluated for powdery mildew in tomato and downy mildew in cucumber.

Biopesticides were evaluated for foliar diseases in tomato and a new disease, downy mildew of basil.

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.

Varieties of tomato and experimentals with resistance to late blight were evaluated for yield and fruit quality as well as disease susceptibility. Ability was examined for this pathogen to survive in rotten tomato fruit and seed from affected fruit and then to infect volunteer seedlings that grew.

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

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.

*Tomato volunteer seedlings with late blight resulting from pathogen surviving on fruit.*

## 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 more often in tomato associated with appearance in the US of new pathogen strains.

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.

Ambient ozone causes acute foliar injury to many crops each year on LI.

Recognized need for practices to improve soil health.

## Impact to Industry

Research conducted in 2011 produced information useful to growers producing vegetables and basil.

Growers were informed of occurrence on LI of downy mildew on different cucurbit crop types.

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.

Powdery mildew resistant melon varieties provided excellent suppression, thus a new pathogen race occurring in the southeastern US did not spread to LI in 2011 contrasting with 2010. Resistant squash and pumpkin varieties were not as effective, substantiating previous results. Genetics of resistance in these crops is different from melons. With some cucurbit crop types more effective control was achieved with homozygous than heterozygous resistance (acorn squash, pumpkin) or with integrated control (fungicide applied to resistant variety) than with fungicides alone (acorn squash, butternut squash, pumpkin). Neither was the case with the summer squash varieties tested. Heterozygous resistant acorn squash, zucchini and pumpkin varieties were ineffective. Resistant zucchini varieties also exhibited different suppression; the one with the fewest genes was ineffective.

Powdery mildew was controlled by products in all 3 recommended fungicide classes: FRAC code 13 (Quintec), 7 (Pristine), and 3 (Procure). Severity was lower on plants treated with new fungicides (7, U6 and U8). Resistance to fungicides in FRAC 1 (Topsin M) and 11 (Quadris, Cabrio, etc) was found to be very common on LI using an in-field seedling bioassay in commercial fields and a leaf disk bioassay conducted with pathogen isolates collected in 2010. Resistance to boscalid (Pristine) was also detected.

Several late blight resistant tomato varieties and experimentals were rated better in researcher and consumer evaluations than a commonly-grown susceptible variety.

The late blight pathogen survived in affected tomato fruit and infected volunteer seedlings that grew.

None of the biopesticides evaluated were effective for foliar diseases in tomato or downy mildew in basil; however, neither were the conventional fungicides included for comparison, documenting the challenges of effectively managing diseases under rainy conditions as occurred during Aug to Sept.

Ozone again reached levels causing visible injury to leaves and reducing yield in sensitive bean line.

## Program Team

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