



## 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 2008 included 1) evaluating registered conventional fungicides and experimentals, and also biopesticides suitable for organic production; 2) examining fungicide sensitivity of the pathogen population in commercial and research fields, and its impact on disease control and management; 3) determining baseline sensitivity of the pathogen to new fungicides; and 4) assessing performance of resistant varieties of melon, pumpkin, and squash (acorn, butternut, yellow summer and zucchini).

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

Research on managing Phytophthora blight included evaluating fungicides in squash, hard-rind pumpkin varieties, and resistant varieties in pepper. A mustard biofumigant cover crop was tested.

In addition to conducting replicated experiments, several commercial pumpkin fields were routinely scouted for the three primary diseases to improve our understanding of their occurrence and how well they are being managed with currently available tools.

Biopesticides approved or being developed for organic production were tested for foliar diseases (Septoria leaf spot and powdery mildew) in tomato with fungicides.

Impact on plant productivity of ambient ozone was examined by monitoring damage to commercial pumpkin crops and conducting research with snap bean and clover bioassay systems developed to assess impact for a national research project.

Additional studies were conducted to examine a reduced tillage production system for pumpkin and fall crucifers. Controlled release fertilizer was compared to conventional in the pumpkin experiment.



Severe ozone injury on 25 Jul on sensitive snap bean line.

### **Project Justification:**

Powdery mildew is the most important disease affecting cucurbit crops every year throughout LI. Fungicide resistance is a major concern. Phytophthora blight is a devastating disease causing extensive losses in several crops on LI, especially pepper and cucurbits. A new strain of the 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.

### **Impact to Industry:**

Research conducted in 2008 generated information influencing management guidelines for 2009.

Resistance in the cucurbit powdery mildew pathogen to FRAC Code 1 (Topsin M) and to Code 11 (Flint) fungicides were detected in all spring squash plantings where a bioassay was conducted on 17 Jul. Therefore fungicides in these classes are not recommended. Pathogen strains were detected able to tolerate higher concentrations of Code 3 and 7 fungicides (Rally, Procure, and Pristine) than Code 13 (Quintec). These fungicides were all equally highly effective when tested alone, indicating that their efficacy was not affected by the pathogen developing resistance; however, control in commercial fields was not as good.

Evaluations of powdery mildew resistant cucurbit varieties revealed a range in ability to suppress disease severity among varieties as well as crop types. Generally varieties with two copies of the major resistant gene, one from each parent, were more effective. Best control was achieved with butternut squash and melons resistant to both races 1 and 2 of the pathogen. Least control was achieved with pumpkin.

Several biopesticides were found to be highly effective for managing foliar diseases in organically-produced tomato.

Participation in the national downy mildew forecasting program lead to timely information on occurrence of this important cucurbit disease and educational materials for growers.

A new pepper variety exhibited very good resistance to Phytophthora blight. Spring-planted mustard biofumigant cover crop showed good promise for managing blight as well as weeds in an observational study. An investigation of this pathogen has revealed that resistance to Code 4 fungicides (Ridomil) is present on some farms, many years after it was last used, and both mating types occur in many fields.

### **Project Team Members:**

George Miller Fox, Research Support Specialist

David Waring, Summer Research Assistant

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Leaflets dying 9 days after ozone injury seen and 2 weeks after ozone reached very high levels; yield was reduced 62%.