

## POWDERY MILDEW OF CUCURBITS

Every year, more than 30,000 acres of field areas are planted to cucurbits in Illinois. Illinois with more than 20,000 acres is the leading state in pumpkin production in the United States (US). Approximately 90% of processing (canned) pumpkins in the US are grown and processed in Illinois. In addition, cantaloupes, cucumbers, gourds, summer and winter squashes, watermelons, and zucchinis are grown in Illinois in more than 10,000 acres.

Powdery mildew is an annual disease of cucurbits in Illinois, severely affecting cantaloupes, gourds, pumpkins, summer and winter squashes, and zucchinis. This disease is primarily managed by fungicide applications. In the past 24 years, we have been conducting field experiments to determine the most effective fungicides for controlling powdery mildew of cucurbits. Newest results of our studies showed that powdery mildew in Illinois develops after

15<sup>th</sup> of July, and the most effective fungicides for managing this disease on cucurbits are quinoxifen (Quintec 2.08SC), triflumizole (Procur 480SC), difenoconazole + cyprodinil (Inspire Super 2.82SC), and flutianil (Gatten SC).

Powdery mildew of cucurbits has been reported to be caused by the fungi *Podosphaera xanthii* (syn. *Sphaerotheca fuliginea*) and *Erysiphe cichoracearum*. It was not clear, however, what



Figure 1. Powdery mildew on a pumpkin vine and fruit stem.

pathogen species was causing powdery mildew in Illinois and the other Midwestern states. We conducted a four-year research to: (1) determine species of the pathogen causing powdery mildew; (2) genetic variation among the isolates; and (3) sensitivity of the collected isolates to widely used fungicides in the Midwest for managing powdery mildew. We collected hundreds of isolates from cucurbits fields in Illinois, other Midwestern states, and some states in eastern, southern, and western US. All collected isolates were identified as *Podosphaera xanthii*, and there were significant genetic variation among the isolates collected from different states and

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For further information contact **Mohammad Babadoost**, Extension Specialist in Fruit and Vegetable Pathology, Department of Crop Sciences, University of Illinois, at Urbana-Champaign. (Phone: 217-333-1523; email: [babadoos@illinois.edu](mailto:babadoos@illinois.edu)).

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even among the isolates collected from Illinois. All of the isolates were highly sensitive to Quintec 2.08SC and Procure 480SC fungicides.

## Symptoms

Powdery mildew is diagnosed by white, powdery mold on plant tissues. Powdery fungal growth develops on both leaf surfaces, petioles, and stems. The disease first appears on stems and petioles (Figure 1). As the disease continues to develop, the white, moldy spots occur on the underside of leaves (Figure 2), then on the upper leaf surfaces (Figure 3). Yellow spots may form on the upper leaf surfaces opposite to powdery mildew colonies on the underside of leaves. Severely infected leaves gradually turn yellow, then wither, die, and finally become dry and brittle. Under favorable conditions the causal fungus may reproduce so rapidly that an entire field may appear white within a week to ten days.



*Figure 2. Powdery mildew lesions on underside of a pumpkin leaf.*

## Disease Cycle

The primary inoculum is believed to be airborne conidia dispersed over long distances, from greenhouse grown cucurbits, or alternative hosts. Conidia are believed to be blown northward from southern states during the spring and early summer. Also, the primary inoculum could come from cleistothecia. Cleistothecia, produced in the late growing season, are small, dark structures with thick wall and contain sexual spores (ascospores). The causal fungi are obligate parasites and



*Figure 3. Powdery mildew on upper surfaces of pumpkin leaves.*

therefore cannot survive in the absence of living host plants, except as cleistothecia.

Cleistothecia have not been observed in Illinois. Thus, the initial inoculum, as conidia (asexual spores), either comes from indoor production of cucurbits in greenhouse during winter season or is blown from the southern states during the growing seasons.

Powdery mildew develops quickly under favorable conditions (dense plant growth, low-intensity light, high relative humidity). High relative humidity is favorable for infection and conidial survival; however, infection can take place in as low as 50% relative humidity. Dryness is favorable for colonization, sporulation, and dispersal of conidia. Rain and free moisture on the plant surface are unfavorable for powdery mildew pathogens. The time between infection and symptom appearance is usually 3-7 days, and a large number of spores (conidia) can be produced in this time. Infection can occur at 50–90°F (10–32°C).

## **Disease Management**

Powdery mildew can be managed effectively by planting resistant cultivars and application of fungicides. Resistance in the plants is usually partial and may require additional complementary control practices. Fungicide application is a common management practice of powdery mildew. Plants should be inspected weekly beginning fruit set initiation and sprayed with fungicides at the first sign of disease (check vines and under leaf surfaces). To accomplish effective control of powdery mildew, good fungicide coverage is needed on the undersides of leaves and inside the canopy. Spray volume of 50 gallons or more per acre, applied with a pressurized sprayer, should provide a good coverage of the canopy. To minimize the potential resistant development in the pathogens, systemic fungicides should be mixed with contact fungicides and application of systemic fungicides with different modes of action should be alternated. There are several contact and systemic fungicides available that effectively control powdery mildew in Illinois. Based on the recent results of our research, applications of Quintec 2.08SC alternated with Procure 480SC, Inspire Super 2.82SC, or Gatten SC effectively control powdery mildew of cucurbits in Illinois. However, annual evaluation of the efficacy of fungicides for effective managing powdery mildew of cucurbits in Illinois is required. For additional information on managing cucurbit powdery mildew, especially fungicide applications, refer to the “Midwest Vegetable Production Guide for Commercial Growers.”