

DOWNY MILDEW OF CUCURBITS

Downy mildew, caused by *Pseudoperonospora cubensis*, is one of the most important foliar diseases of cucurbits. It has been reported worldwide in production areas where humidity and temperature favor its establishment.

Downy mildew occurs in temperate and tropical areas with sufficient leaf wetness periods. Without adequate control measures, downy mildew can result in major crop losses in cucurbits in both open fields and greenhouses. In Illinois, this disease usually occurs toward the end of the growing season, as the pathogen is blown from the Southern states northward.

Symptoms

Downy mildew only affects leaves. Symptoms of downy mildew vary with the host and the environmental conditions. The first symptom is usually the appearance of pale green areas on the upper leaf surface (Figures 1 and 3). The pale green areas soon become yellow in color and angular to irregular in shape, bounded by the leaf veins. As the disease progresses, the lesions may remain yellow (Figure 1) or become brown and necrotic. During moist weather the corresponding lower leaf surface is covered with a downy, pale gray to purple mildew (Figures 2 and 4).

Symptoms on cucumber and squash are angular lesions that are limited by the leaf veins (Figure 1). On watermelon and cantaloupe, symptoms are typically irregular-shaped lesions on the foliage that turn brown rapidly. Infected leaves may experience an upward leaf curl. Symptoms on watermelon and cantaloupe are not as distinctive as on cucumber and squash and could be mistaken for other diseases such as anthracnose.



Figure 1. Downy mildew lesions on the upper surface of a cucumber leaf.



Figure 2. Downy mildew mold on the lower surface of a cucumber leaf.

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Severe infection results in leaves that are completely dead and curled up (Figure 5). This symptom has been described as “wildfire” as the leaves appear to be burned.

Disease Cycle

Pseudoperonospora cubensis is an obligate parasite, meaning that it requires live host tissue in order to survive and reproduce. Because of this feature, the pathogen must overwinter in an area that doesn't experience a hard frost (e.g., southern Florida) and wild or cultivated cucurbits are present.

The pathogen produces large (20 - 40 x 14 – 25 mm in diameter), lemon-shaped sporangia (spores) (Figure 6). The sporangia are borne singly on the pointed tips of sporangiophores that branch at acute angles (Figure 6). Primary infections in the field or garden generally come from spores produced on southern grown crops and carried progressively northward on moist air currents during the spring and summer. The sporangia are disseminated locally from plant to plant and from field to field by splashing rains, moist air currents, insects, tools, farm equipment, the clothing of workers, and through the handling of infected plants. Heavy dews, fogs, frequent rains, and high humidity favor infection and rapid multiplication of the pathogen. Symptoms appear 4-12 days after infection. The pathogen favors cool and moist conditions. Optimum conditions for sporulation are 59°F (5°C) with 6-12 hours of moisture present (usually in the form of morning dew). Once infection occurs a new crop of sporangia are produced in 4 to 12 days, depending on temperature and day length.

The downy mildew pathogen does not overwinter in plant debris in Illinois. The pathogen may overwinter in some areas as thick-walled oospores which are capable of withstanding extremes in temperature and dryness. It is not clear if oospores play any role in disease development.

Five pathotypes have been described for *P. cubensis*. All described pathotypes infect susceptible cucumber and netted melon cultivars, but not all are compatible of infecting



Figure 3. Downy mildew spots on the upper surface of a pumpkin leaf.



Figure 4. Downy mildew mold on the lower surface of a pumpkin leaf.



Figure 5. A pumpkin field with *Pseudoperonospora cubensis*-infected plants.

watermelon, squash, or pumpkin. This explains why cucumber and netted melons are sometimes heavily infected, while nearby watermelon, squash, or pumpkin are not affected.

Disease Management

Management of downy mildew on cucurbits is achieved by planting resistant cultivars, early planting of crops, and/or fungicide applications. Cucumber cultivars resistant to downy mildew are available. Early plantings for crops for July harvest often escape infection with downy mildew pathogen, while plantings for harvest in August or later in the season are vulnerable. Because of the potential for rapid plant infection, sprays should be initiated on a preventive basis for vulnerable plantings. Fields should be scouted regularly for disease development. When downy mildew is present, fungicides with systemic activity tend to be more effective than protectants. Using systemic fungicides mixed with protectants will minimize resistant development in the pathogen. A disease-forecasting program is available (www.ces.ncsu.edu/depts/pp/cucurbit). For the update information on controlling cucurbit downy mildew, especially by fungicide applications, refer to the Midwest Vegetable Production Guide for Commercial Growers, publication C1373 (<http://www.btny.purdue.edu/pubs/id/id-56/>).

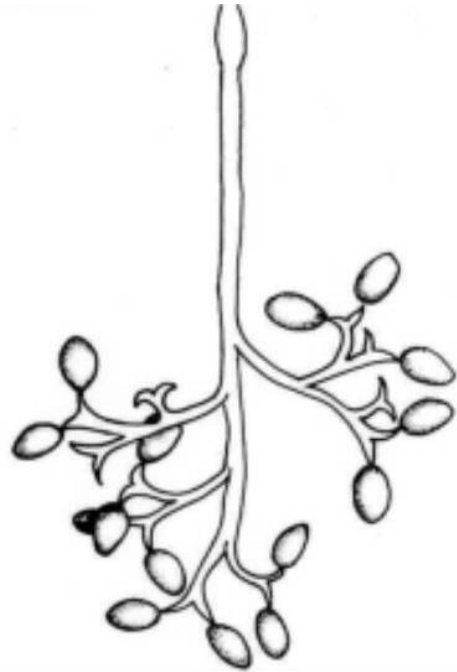


Figure 6. Sporangiophore and sporangia of the downy mildew pathogen, Pseudoperonospora cubensis.