



DOWNY MILDEW CONTROL IN CUCURBITS

CURRENT TOPIC

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Downy mildew, caused by the fungal organism *Pseudoperonospora cubensis*, is most destructive to cucumber and cantaloupe, though all cucurbits are susceptible. Symptoms first appear as pale green areas on the upper leaf surfaces. These change to yellow angular spots. A fine white-to-grayish downy growth soon appears on the lower leaf surface. Infected leaves generally die but may remain erect while the edges of the leaf blades curl inward. Usually, the leaves near the center of a hill or row are infected first. The infected area spreads outward, causing defoliation, stunted growth, and poor fruit development. The entire plant may eventually be killed (1, 2).

The fungus is easily carried by wind currents, rain splash, farm implements, or the hands and clothes of farm workers. It is favored by cool to moderately warm temperatures, but tolerates hot days, although long periods of dry hot weather can stifle the spread of the disease (3). Unlike powdery mildew, it requires humidity to flourish. Therefore, downy mildew is most aggressive when heavy dews, fog, and frequent rains occur (1, 2).

Downy mildew does not overwinter beyond Mexico and the southernmost tier of U.S. states, where it survives on cultivated and wild cucurbit plants. Spores are blown northward each season as favorable seasonal conditions advance. As a result, the disease is most common on late summer plantings and is infrequently seen on spring cucurbits (4).

Monitoring

Keeping abreast of when, and how severely, downy mildew is occurring in your area can help you determine the proper time to treat it. The North American Plant Disease Forecast Center is an online forecasting network that tracks outbreaks of downy mildew from March through the end of the growing season. Data is posted twice weekly. Growers can use the website to identify areas where an outbreak is reported, as well as spore movement in that area. The site also offers information on control measures, photos, and more. Because the website relies on growers and others to report the outbreaks, it isn't comprehensive or foolproof. It is, however, a useful monitoring tool. The website is located at <<http://www.ces.ncsu.edu/depts/pp/cucurbit/>>.

Resistant Varieties

One of the principal means of managing downy mildew in cantaloupe and cucumber is the use of genetically resistant cultivars. Resistance has not been developed in other cucurbits, though some squash varieties like Super Select and Zucchini Select are considered to be tolerant (5), as are cucumber varieties like Poinsett and Galaxie (6). The Virginia Extension publication *Downy Mildew of Cucurbits* (3) identifies other resistant cucumber cultivars. Growers are advised to contact Coopera-

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tive Extension and local seed suppliers for assistance in selecting resistant varieties that also perform well in their location.

Cultural Controls

Because this disease is carried to most fields on light winds, cultural practices like crop rotation and sanitation have a limited effect on the incidence of downy mildew. Still, there are several things that growers can do to suppress the disease. Growing vigorous plants, capable of withstanding or repelling disease onslaughts, is the first step. This involves careful irrigation and soil fertility management. ATTRA's publications on soil management and related matters include *Sustainable Soil Management*, *Manures for Organic Crop Production*, *Alternative Soil Amendments*, and *Sources of Organic Fertilizers and Amendments*.

Good soil fertility management can often be backed up with foliar fertilization, which some growers believe can assist in pest resistance. For additional information see the ATTRA publication *Foliar Fertilization*.

Further cultural considerations include selecting growing sites with good air drainage, full sunlight, and low humidity. Using drip irrigation, or scheduling overhead irrigation to avoid excessive leaf wetness, will also reduce disease incidence. When detected early, disease spread might be slowed somewhat by removing and destroying infected plants, and by taking care not to transport the disease by hand or on infected tools and equipment.

Alternative Pesticides

Along with resistant varieties, fungicides are considered the principal means of downy mildew control in cucurbits. There are several alternatives to synthetic fungicides. Be certain to use all pesticides, synthetic or natural, according to label instructions.

Copper

Copper-based fungicides have traditionally been recommended for suppressing downy mildew in organic production systems. Caution is advised, however, as copper can be phytotoxic to cucurbits. Crop damage appears to be most common during periods of cool wet weather—precisely the conditions in which downy mildew thrives (7). As a result, it is suggested that the most dilute application recommended for each product be followed (5).

The use of copper fungicides in organic production is somewhat controversial. Copper is a *regulated* material in organic production. Though an essential plant nutrient in small amounts, fungicidal levels of copper are directly toxic to some beneficial organisms such as earthworms and several soil microbes such as blue-green algae—an important nitrogen-fixer in many soils. Excessive use can also result in the buildup to toxic (crop-damaging) levels in the soil—particularly in climates where little to no leaching occurs. Thus, growers who use these sprays frequently must monitor soil copper levels through regular soil testing.

Neem Oil

Neem oil is a botanical pesticide derived from the tree species *Azadirachta indica*. It is a multi-purpose insecticide, miticide, and fungicide labeled for control of both downy and powdery mildews on cucurbits (8).

