



LEAF MOLD OF GREENHOUSE TOMATOES

Leaf mold, caused by the fungus *Fulvia fulva* (synonym *Cladosporium fulvum*), is a common and destructive disease on tomatoes worldwide grown under humid conditions. Leaf mold is primarily a problem on greenhouse tomatoes, but occasionally develops on field and garden-grown tomatoes if conditions are favorable. The disease is most destructive in the greenhouse during the fall, early winter, and spring when the relative humidity is most likely to be high, and air temperatures are such that heating is not continuous.

When humidity is high, the fungus develops rapidly on the foliage, usually starting on the lower leaves and progressing upward. If the disease is not controlled, large portions of the foliage can be killed, resulting in significant yield reductions. Early infections are most threatening.

SYMPTOMS

Symptoms usually only develop on foliage, with fruit infections being rare. The first leaf symptom is the appearance of small, white, pale green, or yellowish spots with indefinite margins on the upper leaf surface. On the corresponding areas of the lower leaf surface the fungus begins to sporulate. The fungus appears as an olive green to grayish purple velvety growth (Figure 1), composed mostly of spores (conidia) of the leaf mold fungus. Infected leaf tissue becomes yellowish brown, and the leaf curls, withers, and drops prematurely. The withering and defoliation progress up the plant until the entire plant may appear dry and dead. Symptoms can also develop on blossoms and fruit. Blossoms can be killed before fruit set. Fruit infections appear as a black, leathery, stem-end rot, which can develop on both green and ripe tomato fruit. The lesion margins may be irregular, and up to one-third of the fruit surface can be affected.



Figure 1. Tomato leaf mold. The undersides of leaves often show patches of grayish purple mold. The upper sides have yellowish or light green spots immediately opposite the moldy patches.

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@uiuc.edu).

DISEASE CYCLE

The fungus survives between seasons as conidia (spores), as sclerotia on plant debris, in seed, and as a soil saprophyte. Conidia are resistant to drying, and may survive in the greenhouse at least 1 year in the absence of a susceptible host, and new conidia can be produced from surviving sclerotia. The conidia act as primary inoculum to infect plants when conditions become favorable. Large numbers of spores are produced on the undersurface of infected leaves (Figure 2), and these spores are easily spread from plant to plant by air currents, splashing water, on tools, and clothing of workers, and possibly by insects. Spores germinate in water films or when humidity levels are above 85 percent, at temperatures between 40° and 94°F (4° and 34°C). The optimum temperature for germination is between 75° and 78°F (24° and 26°C). Leaves are infected through stomata when humidity levels are 85 percent or higher. Infection occurs most rapidly when humidity levels at the leaf surface fluctuate between 85 percent (day) and 100 percent (night). Symptoms usually begin to appear approximately 10 days after inoculation, with spore formation beginning a few days later. Spore production is most abundant at relative humidity between 78 and 92 percent, but can occur at humidity as low as 58 percent.

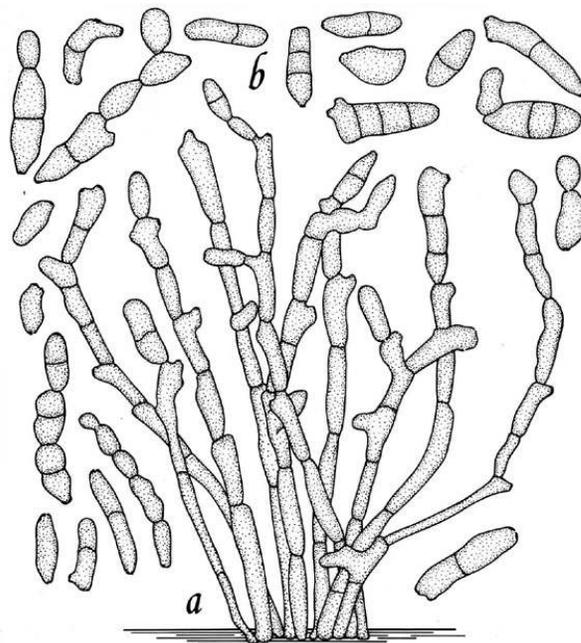


Figure 2. *Fulvia fulva* the tomato leaf mold fungus as it might appear under a high-power microscope: (a) a fascicle of conidiophores emerging from the leaf surface; (b) conidia (drawing by Lenore Gray).

CONTROL

1. Whenever possible, keep the relative humidity in the greenhouse below 85 percent, and keep free moisture from forming or persisting on leaves. This will inhibit the development and spread of the leaf mold fungus.
 - a. Provide **good** ventilation and as much light as possible. Circulate air with fans to eliminate dead-air pockets.
 - b. Keep night temperatures in the greenhouse **warmer** than outside air temperatures. If leaf mold becomes a problem, some night heating may be needed in Illinois through late spring and again in early fall.
 - c. Attempt to avoid wetting the leaves when watering. Water early in the day to allow leaves to dry by mid-afternoon.
 - d. Maintain a temperature of at least 60° to 65°F (16° to 18°C) throughout the season.
 - e. Provide adequate plant and row spacing to avoid excessive shading.

2. Leaf mold resistant varieties are available, but because the fungus mutates readily (there are at least 12 races of the pathogen) resistant varieties are of limited use. Because new virulent races can develop in only a few years, a tomato variety which is resistant one year may be very susceptible the next. If available, grow varieties with more than one leaf mold resistance gene. Refer to Midwest Vegetable Production Guide for Commercial Growers. Also consult current seed catalogs and trade publications.
3. A fungicide spray program may help control the disease, but should be considered secondary to environmental control measures. A weekly spray program may be necessary. For current recommendations refer to the above mentioned circular. Be sure to **thoroughly** cover all above-ground parts of every plant, especially the lower surface of the foliage, with each spray.
4. Reduce primary inoculum levels through sanitation, steam treatment of greenhouses, and seed treatment.
 - a. After harvest, carefully remove and destroy (burn) **all** plant debris.
 - b. Where possible, steam entire greenhouse sections between crops, preferably on a bright, hot day when little steam will be needed. Close all ventilators, and maintain the temperature at 135°F (57°C) for at least six hours.
 - c. Where necessary, use hot water treated seed. Treat seed for 25 minutes at exactly 122°F (50°C). See Report on Plant Diseases No. 915, Vegetable Seed Treatment, for details.

The publications mentioned above are available at your nearest Extension Center.