Agronomic Spotlight

Seminis grow forward

Two Tomato Leaf Mold Diseases

- Two fungal pathogens, *Passalora fulva* and *Pseudocercospora fuligena,* cause leaf mold disease on tomato.
- Both leaf mold and Cercospora leaf mold are favored by humid conditions.
- Sanitation and practices that reduce humidity in the canopy are the primary methods for managing leaf mold diseases.

Two different leaf mold diseases affect tomatoes growing in warm, humid environments. Leaf mold, also known as gray leaf mold and tomato leaf mold, is caused by the fungus *Passalora fulva* and has been a problem on tomatoes grown in protected culture systems (greenhouse and high tunnel) for many years. However, it can also cause defoliation and yield reductions for field-grown tomatoes. Leaf mold can be especially severe during the spring and early summer in the southeastern U.S.[1,2] Cercospora leaf mold, also known as black mold, is caused by the fungus *Pseudocercospora fuligena*. Cercospora leaf mold was first described in the Philippines in 1938 and has been an important disease of tomato in Asia's tropical and subtropical regions.[3,4] The disease was first observed in the U.S. in Florida in 1974. It has since been observed in North Carolina, Ohio, and Indiana in the U.S., and it occurs in Mexico.[5,6,7]

Symptoms

As the names suggest, both of these leaf mold diseases primarily affect tomato leaves. Leaf mold usually appears first on older leaves where pale-green to yellowish spots develop on the upper leaf surface. The spots turn a brighter yellow, and the lesion margins are not well defined (Figure 1a).[1] An olive-green to purple, velvety, fungal growth (mold) develops in the lesion area on the underside of the leaf (Figure 1b).[1,8] The lesions can enlarge and coalesce when severe. The affected leaves can curl, wither, turn brown, and prematurely drop from the plants. The disease can sometimes affect petioles, fruit stems, flowers, and fruit. Infected flowers turn black and fall off. Fruit lesions appear as smooth, black areas that become sunken, dry, and leathery with age.[1,8]

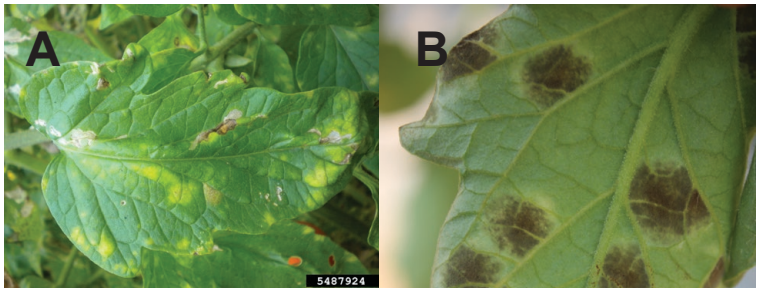

Figure 1. Symptoms of leaf mold caused by *Passalora fulva*; (A) yellow lesions on the upper leaf surface, Elizabeth Bush, Virginia Polytechnic Institute and State University, Bugwood.org; (B) purple mold growth on the underside of a tomato leaf.

Symptoms of Cercospora leaf mold appear initially as small, light-green to pale-yellow lesions that develop between the veins on the leaf. Like the lesions of leaf mold, Cercospora leaf mold lesions do not have distinct margins, but as they develop, their color becomes more mustard-yellow compared to the bright yellow lesions seen with leaf mold (Figure 2a).[3,4,7] Gray to black fungal growth develops initially on the underside of the leaf, but eventually, the growth will develop on both leaf surfaces (Figure 2b). Leaves severely affected by Cercospora leaf mold can become twisted, curl upward, and become dry. Affected leaves often remain attached to the plant, and the disease progresses from older to younger leaves. Some symptoms may develop on petioles and fruit/flower stems, but the fruit are not affected. Yield reductions of 30 to 34% have been documented in several studies.[3,8,9]

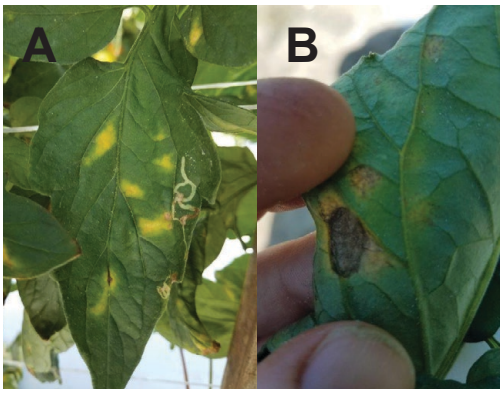

Figure 2. Symptoms of Cercospora leaf mold; (A) yellow lesions on the upper leaf surface; (B) gray to black mold growth on the underside of the leaf. Gary Vallad, University of Florida.

Cycles and Conditions

Cultivated and wild species of tomato are the only known hosts of *P. fulvia*, although some solanaceous weed species may also be hosts. The Cercospora leaf mold pathogen is known to infect tomato, eggplant, pepper (in lab tests), black nightshade, and poisonous gooseberry.[2,3,10]

The leaf mold pathogen overwinters in crop residue and as spores and sclerotia (survival structures) in the soil for twelve months or more under field conditions. The spores of the pathogen are spread by wind, splashing water, tools, on the clothing of workers, and possibly by insects. The pathogen can also be seedborne. Infection and disease development are favored by high humidity and moderate temperatures. Relative humidity (RH) levels of 75 to 90% are needed, with an optimum

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RH of 85%. The disease develops at temperatures between 40° and 90°F, with the optimum between 72° and 76°F. The disease rarely occurs at temperatures below 50°F. New spores can form within ten to twelve days after infection, and there can be multiple cycles per season. [1,2,8]

The Cercospora leaf mold pathogen overwinters on infected plants in abandoned fields or on alternate hosts, and it can probably survive for a time on crop debris. The spores are spread by wind, splashing and running water, on tools, and on the clothing of workers. The pathogen is most prevalent in tropical and subtropical regions. As compared to leaf mold, Cercospora leaf mold is favored by somewhat warmer temperatures (79° to 86°F) with an optimum temperature of 82°F. The spores of the fungus only germinate when the relative humidity is above 85%. When the relative humidity is above 91%, no free moisture (leaf wetness) is needed for spores to germinate. Symptoms can become visible within six days after infection, and new spores can form within twelve days. Cercospora leaf mold is not known to be seedborne. [3,4,9,10]

Management

Sanitation is an important management tool for both of these leaf mold diseases. Crop residues should be removed or plowed into the soil promptly after harvest. Crop debris should also be removed from the field after pruning operations. For greenhouse and high tunnel operations, clean and sanitize greenhouse surfaces using steam, dilute bleach, or sanitizing solutions. Stakes, trellises, and other equipment should be sanitized before reuse. Because the leaf mold pathogen can overwinter in the field, crop rotation can help manage this disease, and it may help manage Cercospora leaf mold. [1,2,3,7,8]

Avoid overhead irrigation, and promote good airflow within the canopy by using lower planting densities and open staking and pruning techniques. In protected culture systems, use ventilation for good air circulation, open vents on greenhouses or roll-up sidewalls on high tunnels to keep humidity levels below the favorable range. [1,8]

Foliar applications of fungicides can help manage leaf mold caused by *Passalora fulva* (also listed as *Fulvia fulva* and *Cladosporium* on some fungicide labels). Applications should begin before infection occurs when conditions are favorable for disease development. Repeat applications according to label instructions. [8] It is important that applications cover both upper and lower leaf surfaces. [2] If the disease first appears after the beginning of harvest, fungicide applications will probably not be needed to prevent yield losses. [7]

To help prevent the development of fungicide resistance in the pathogen, alternate applications using fungicides with different modes of action. Several fungicides are registered for managing leaf mold on tomato. Check regional production or pest management guides for current lists of registered products. [11] For use in greenhouse or high tunnel systems, make sure that the product is registered for that use.

Some articles indicate that many of the fungicides useful for managing leaf mold caused by *Passalora fulva* may also help control Cercospora leaf mold. [3,6,7] However, many of the fungicide labels indicate that the product can be used for managing leaf mold caused by *Fulvia fulva* or *Cladosporium* spp. These are former names (synonyms) of *Passalora fulva.* Use of the products specifically for the control of Cercospora leaf mold is not indicated on most fungicide labels.

Resistance to leaf mold has been characterized in tomato. However, there are twelve races of *Passalora fulva*, and no tomato variety has resistance to all known races. Therefore, using resistant varieties may not be effective in many areas. Disease resistance should be used in conjunction with other disease management strategies. [2,8] Sources of resistance to Cercospora leaf mold have also been identified in wild tomato species. So far, this resistance is not available in any commercial tomato varieties. [10,12]

Sources:

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Websites verified 9/22/2021

For additional agronomic information, please contact your local seed representative.

Performance may vary from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields. The recommendations in this article are based upon information obtained from the cited sources and should be used as a quick reference for information about tomato production. The content of this article should not be substituted for the professional opinion of a producer, grower, agronomist, pathologist and similar professional dealing with this specific crop.

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