GROWERTALKS

Features

3/26/2014

Tomato Leaf Mold

Helen Margaret Griffiths

Production of tomatoes under high tunnel and plastic has increased significantly over the last few years in part due to consumers demand for “local” produce. Even though growing under these conditions can reduce the occurrence of some diseases, it can increase the occurrence of others. Tomato leaf mold disease is one that’s showing a significant increase. It’s caused by a fungus formerly known as *Cladosporium fulvum*, but now known as *Fulvia fulva* by producers and those in the seed trade, and *Passalora fulva* by mycologists. The disease is rarely seen on field-grown plants, and when it’s observed in the field, it’s due to infected greenhouse-grown transplants.

Figure 1. Symptoms characteristic of the early stage of tomato leaf mold. The yellow lesions on the upper leaf surface have poorly defined margins.

Why the increase in appearance in the plastic houses and high tunnels? Judson Reid from Cornell Cooperative Extension in Penn Yan, New York, who works extensively with greenhouse crop producers, says, “The use of susceptible field varieties (both determinates and heirlooms) within the high relative humidity environment of tunnels is to blame.” Spores can remain viable on plant debris and in soil. If producers don’t rotate crops in the tunnels, this can result in an increased incidence of disease.

What are the sources of inoculum and methods of disease spread? Spores of the fungus overwinter on plant debris, volunteer tomato plants and in the soil where they can remain viable for at least a year. When humidity is over 85%, spores can germinate at temperatures from 39F to 93F (4C to 34C). The greatest spore production is observed when the humidity is between 75% to 90%, but spore production has been detected when humidity was as low as 58%. Infection occurs through leaf stomata with conidia being produced on the underside of the leaves. Spores are easily spread from plant to plant by air currents, water, tools, workers and possibly insects. Flowers may become infected, but they usually die before fruit set.

Seed can be contaminated, although this isn’t usually the primary source of inoculum. As leaf mold can be a devastating disease for the tomato producer, it’s recommended that growers start with seed certified to be pathogen-free or that they hot water treat the seed prior to seeding.

There are weeds in the nightshade family susceptible to tomato leaf mold and hence these plants are a potential inoculum source. Both inside the hoop houses and surrounding areas should be monitored for the presence of these weeds.

Disease symptoms

The older leaves become infected first. Initial symptoms are pale green lesions, which rapidly enlarge and turn to yellow spots with poorly defined margins (Figure 1). These symptoms are sometimes confused with powdery mildew infections or nutrient deficiency. With *F. fulva* infections, the corresponding area of the lower leaf surface becomes covered with an olive/brown velvety growth, which are mainly spores of the fungus (Figures 2 and 3). As the infection progresses, the leaf tissue becomes chlorotic, the leaves curl and drop prematurely. The leaves die from the base of the plant and progress upwards (Figure 4) until the entire plant is dead.

Figure 2. Olive/brown fungal spores on the underside of the leaf are typical of those observed with tomato leaf mold.

In addition to confusing with powdery mildew, growers may confuse leaf mold with grey mold caused by *Botrytis cinerea*. *B. cinerea* has more powdery spores than those observed with *F. fulva*. The fungal growth of *B. cinerea* is fluffier than with *F. fulva*. Even though powdery mildew infections usually begin with pale green or chlorotic areas on leaves, they can be differentiated from *B. cinerea* and *F. fulva* by the appearance of diffuse powdery patches, which often occur on upper and lower leaf surfaces. *B. cinerea* may colonize leaves already infected by *F. fulva*, masking the leaf mold symptoms and making the diagnosis more challenging.

Figure 3. Close up of the spores on the underside of a leaf with tomato leaf mold.

Foliage infections are the most common, although stems, petioles, blossoms and fruit infections can occur. Fruit infection isn't very common, but both green and ripe tomato fruit can become infected (Figure 5).

Control methods

Depending exclusively upon chemicals isn't a good management approach. In the case of leaf mold of tomato, using resistant varieties, utilizing sound cultural practices—particularly with regards to controlling humidity and sanitation—are the best ways to prevent and control occurrences of the disease. There are many tomato varieties with good resistance, but as there are at least 12 races of the fungus, tomato breeders have concentrated on breeding for resistance to only some. Not all varieties have been bred to give resistance to the same range of races and, therefore, growers are advised to choose those with resistance to the broadest list of races. Thomas Zitter from Cornell University in November 2013 generated a useful table on tomato varieties and their various attributes, including leaf mold resistance and seed source: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/TMV%20and%20Leaf%20Mold%20Variety%

20List.pdf

Reid says that for the Finger Lakes region of Central New York, his favorites with resistance are Primo Red, Red Deuce and Red Mountain (determinates) and Trust, Geronimo, Rebelski and Panzer (indeterminates).

Figure 4. Tomato leaf mold killing tomato plants in a high tunnel.

Humidity is a major driver in the epidemiology of leaf mold and, therefore, reducing the period of leaf wetness is critical. Growers should do everything possible to reduce humidity. This includes avoiding watering foliage—particularly in the evening—because depending on the temperature in the house, the leaves may remain wet overnight. Good ventilation is important in reducing the overall humidity of the high tunnel or greenhouse. Crowding of plants should be avoided, as disease severity is likely to be worse under conditions of high planting densities. Staking and pruning of plants can help with air movement around the plants.

Once disease symptoms are observed on plants, the leaves should be promptly pruned and destroyed. As tools and workers can easily transfer spores to new plants, care needs to be exercised in the pruning process. Plants should not be handled during times of high humidity.

When leaf mold has been a problem, all plant material, including weeds, should be removed and destroyed, and the greenhouse disinfected.

Crop rotation is important for controlling tomato leaf mold. Producers, whenever possible, should avoid growing tomatoes in the same location year after year.

There are a number of fungicides labeled that, used in combination with other disease management tools, may assist in controlling tomato leaf mold. For the organic producer, OMRI-approved products include Camelot O, Cueva and Oxidate.

Figure 5. Tomato fruit damaged by tomato leaf mold.

For the conventional producer, basic copper is labeled and various products containing mancozeb (e.g. Manzate, Mankocide, Gavel) may give some protection. The efficacy of these products depends greatly upon timing of application and adequate cover of the plants. Quadris Top and Inspire Super will give some systemic activity, but the latter should not be used on cherry tomatoes, and Quadris Top should not be used for transplant production. More details are available in an article published by Thomas Zitter: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/TEP%20Labeled%20Rates.pdf

The regulations for use of each product vary with geographic location and, depending on the fungicide mode of action, there may be resistance concerns. The specific directions on fungicide labels must be followed and

supersede any statements in this article if there's a conflict. **GT**

Please note: Any reference to commercial products, trade or brand names is for information only.

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