Identification and Management of Foliar Diseases of Tomato

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Managing diseases is critical to successful tomato production because diseases, unfortunately, are a common occurrence wherever tomatoes are grown. All plantings are affected, even those grown under protection (greenhouses and high tunnels) and in small home gardens. An important aspect of effective management is accurate and early identification to ensure control practices used are appropriate. A key for diagnosing tomato diseases is on-line at: http://vegetablemdonline.ppath.cornell.edu/DiagnosticKeys/TomKey.html. There are many more disease images that have been posted on the web. These can be found by launching Google Image Search (click on 'Images' in the upper left corner of the Google page) and then entering 'tomato' and a disease name in the search box.

Septoria leaf spot is probably the most common foliar disease of field-grown tomatoes in the northeast. Bacterial speck, early blight and bacterial canker are also common. Protected tomatoes are most commonly affected by leaf mold, which occurs rarely in the field. Powdery mildew and white mold are also common.

Some pathogens causing foliar diseases infect fruit as well; others indirectly affect yield by causing defoliation, which exposes fruit to sunburn, reducing fruit quality (including taste), and reducing fruit production.

Symptoms and key aspects of diseases occurring in the northeast are described below followed by an integrated management program.

Bacterial speck, bacterial spot, and bacterial canker. Symptoms include small black spots on leaves sometimes with a yellow halo. Young affected leaves can be distorted. Leaf edges can be brown, sometimes with a yellow inner margin, especially with canker. Dark spots form on stems and petioles. Small black spots also develop on fruit affected by speck or spot; spots due to canker are raised, white with brown center.

Botrytis gray mold. Gray fuzzy fungal growth developing on affected leaves, stems, dying flowers and fruit is diagnostic. The pathogen usually needs to first become established on dead or wounded tissue. Occurs in the greenhouse on transplants and established plants as well as in the field.

Early blight. Dark brown spots appear first on oldest leaves. They begin as small spots that develop a characteristic target-shape as they enlarge. Note that susceptibility is related to maturity, thus early maturing varieties are affected first.

Late blight. Leaf spots begin as small, olive green to brown, water-soaked spots that rapidly enlarge, become darker, and develop a whitish fuzzy fungal growth especially on the lower leaf surface under moist conditions, Dark brown spots form on stems and fruit. Affected tissue can die rapidly when fungicides are not applied. This disease occurs sporadically.

Leaf mold. Pale yellowish spots develop on upper leaf surfaces opposite the characteristic gray fuzzy fungal growth on the lower surface.

Powdery mildew. White powdery spots develop on both leaf surfaces. Low leaves in the canopy often are affected first.

Septoria leaf spot. Symptoms resemble those of initial early blight, but spots remain small and develop a tan center with very tiny black pimple-like structures containing spores. Dark spots also form on stems and petioles.

Tomato spotted wilt (TSWV) and other viruses. Typical foliar symptoms caused by most viruses include various shades of green in a mosaic pattern and distorted leaves (e.g. shoestring appearance). These are very different from symptoms caused by fungi and bacteria. An exception is TSWV, which causes die-back of growing tips, brown lesions on stems and brown discoloration on leaves and fruit. Diseases caused by viruses are difficult to manage. Fortunately they rarely are sufficiently severe in the northeast to be of economic concern with the exception of TSWV when transplants become infected due to being produced in a greenhouse with infected ornamental plants.

White mold. Stem lesions start at leaf axils or stem joints as water-soaked areas. Affected tissue becomes light gray (bleached appearance), develops cottony growth under moist conditions, and eventually the characteristic black, hard fungal sclerotia form in or on the stem. Large areas of the stem usually are affected causing the distal portion to wilt.

Select resistant varieties. See http://vegetablemdonline.ppath.cornell.edu/Tables/TableList.htm for tables of varieties with resistance.

Use seed that has been treated and tested for pathogens. Treatments for seed-borne pathogens include hot water, which is best for pathogens inside seeds but it can impact germination, hydrochloric acid, and sodium hypochlorite. Fungicides are then applied to seed for seed decay. Bacterial diseases, early blight and Septoria leaf spot.

Clean and sanitize greenhouses and planting materials, also trellising stakes.

Inspect transplants for symptoms. Purchase certified transplants. Do not plant seedlings with symptoms. An entire tray with symptomatic seedlings should be discarded, especially with bacterial diseases, because the pathogen could have been spread.

Rotate land to control diseases caused by pathogens that can survive in soil on infested crop debris, which include bacterial diseases, early blight, Septoria leaf spot. Very long rotation is needed for white mold.

Mulch and trellise to physically and spatially separate foliage from pathogens in soil.

Minimize leaf wetness. Select a site with good air movement and use drip irrigation or overhead irrigate when leaves will have time to dry before evening dew period to manage foliar diseases. Most fungal and bacterial diseases.

Reduce humidity in protected crops (greenhouses and high tunnels) with fans and vents, spacing plants (5-ft row spacing recommended), and pruning lower leaves.

Physically separate successive plantings.

Manage volunteer tomatoes, solanaceous weeds and other weeds susceptible to tomato diseases.

Avoid moving infested soil into clean fields. Work last in fields where pathogens occur that survive in soil, then clean equipment before working in fields where these diseases haven't occurred (see list under rotate above).

Do not handle wet plants. Routinely clean hands and disinfect tools contacting plant sap.

Inspect plants weekly for symptoms, especially during fruit production. Include leaves that are low and buried in the canopy where conditions are most favorable for several diseases. Early in the day when humidity is high is the best time to look because fungal growth characteristic of some diseases is more likely to be present. Maintain records of disease occurrence, management practices used and

Apply fungicides and bactericides preventively or beginning at disease onset. Do not wait until a disease is well established to start treatments. Use TOM-CAST to determine when to apply fungicides for early blight. Check extension newsletters for reports of late blight, which occurs sporadically, on potato and tomato. A list of fungicides labeled for use on tomatoes is on-line at http://vegetablemdonline.ppath.cornell.edu/NewsArticles/Tom_LabeledRts.html. Do not spray when plants are wet or use an airblast sprayer for bacterial diseases to avoid moving pathogens.

General fungicide program for field-grown tomatoes:

Contans for white mold before planting, at least 3 to 4 months before disease onset. Treatment in the fall and again in the spring may improve control.

Streptomycin for bacterial diseases, Decree for Botrytis gray mold, and copper for bacterial and fungal diseases during transplant production.

Protectant fungicides (copper, chlorothalonil, maneb, mancozeb) before disease observed. Alternate with Actigard for bacterial speck and spot.

Fungicides for specific diseases (alternation recommended for resistance management):

Botrytis gray mold: Endura (no more than 2 sprays), Scala + protectant, Cabrio (suppresses), Serenade.

Early blight: QoI fungicides (FRAC Group 11; Amistar, Cabrio), Reason, Scala, Tanos. Pathogen strains resistant to QoI fungicides have been detected in a few locations in the US.

Late blight: Curzate, Tanos, Ranman, Reason, Previcur Flex, Gavel, and Forum (Acrobat). These need to be tank-mixed with a protectant fungicide, except for Gavel which contains mancozeb. Note that applying chlorothalonil weekly starting before disease onset has provided good control in fungicide efficacy experiments.

Septoria leaf spot: Quadris (Amistar)

Leaf mold: no fungicides specifically labeled for this disease.

Destroy infested crop debris after harvest and incorporate deeply into soil to hasten decomposition for pathogens that can survive on debris in soil. Bacterial diseases, early blight, and Septoria leaf spot.

Please Note: The specific directions on fungicide labels must be adhered to -- they supersede these recommendations, if there is a conflict. Check labels for local use restrictions (eg Reason cannot be used on LI). Any reference to commercial products, trade or brand names is for information only; no endorsement is intended.