



Early Blight & Septoria Leaf Spot of Tomato

Disease Management for Commercial Growers

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IMPORTANCE

Early blight (FIGURE 1) and Septoria leaf spot (FIGURE 2) are the most common fungal diseases of tomato in Kentucky. Often occurring together, these diseases can significantly reduce yields during seasons with humid, wet weather.



FIGURE 1. EARLY BLIGHT IS CHARACTERIZED BY TARGET-LIKE LESIONS WITH CONCENTRIC RINGS.

FIGURE 2. SEPTORIA LEAF SPOTS ARE TAN TO GRAY WITH DARKER MARGINS.

SYMPTOMS & SIGNS

Early Blight

Leaves

Lesions on seedling leaves, although uncommon, begin as small, dark, slightly sunken spots that enlarge and may exceed 1/2 inch. The circular or elliptical spots have a target-like appearance due to alternating light and dark brown concentric rings (FIGURE 1). Early in disease development, spots may be difficult to distinguish from bacterial spot, but as the season progresses, rings become more apparent within early blight lesions. Additionally, bacterial spot typically progresses much faster than early blight, resulting in rapid dieback.

On established plants, small, brown-black lesions appear on older foliage, especially where leaves touch the soil. These lesions enlarge rapidly and are also characterized by concentric rings. Leaf tissue surrounding the lesions may become yellow (chlorotic) (FIGURE 3) and result in overall blighting of leaves (FIGURE 4), followed by defoliation.

Fruit

Infections often develop near the stem attachment on both green and maturing fruit. Like the leaf spots, fruit lesions are also brown to black and have concentric rings (FIGURE 5). Diseased areas may appear leathery and sunken; a thick mass of black spores develops on the surface under humid conditions, but they may not be visible to the naked eye. As a secondary effect of this disease, healthy fruit can be damaged by sunscald when plants are defoliated.

Stems & petioles

Lesions developing on stems and petioles are elliptical and have the same target-like appearance characteristic of this disease (FIGURE 6). These lesions may encircle, or girdle, affected stems and petioles.



FIGURE 3. LEAF TISSUE SURROUNDING EARLY BLIGHT LESIONS TURNS YELLOW.

FIGURE 4. SEVERE EARLY BLIGHT INFECTIONS RESULT IN EXTENSIVE BLIGHTING AND DEFOLIATION.

FIGURE 5. EARLY BLIGHT FRUIT INFECTIONS ARE SIMILAR IN APPEARANCE TO FOLIAR LESIONS.

FIGURE 6. TARGET-LIKE LESIONS CAN DEVELOP ON STEMS AND PETIOLES AS A RESULT OF EARLY BLIGHT INFECTIONS.

Septoria Leaf Spot

Septoria leaf spot first develops on lower foliage and progresses up the plant. It can occur at any stage of plant maturity, but commonly develops after the first fruit set. Lesions can appear on stems and leaflets. The circular to semi-circular spots have tan to gray centers with dark brown margins (FIGURE 2); centers become dotted with black spore-producing structures (pycnidia) (FIGURE 7). Spots are often surrounded by a yellow halo and individually remain smaller than 1/3 inch in diameter. However, Septoria lesions often merge, progressing to a blight that kills leaves and causes plants to defoliate. Infections on fruit are exceedingly rare.



FIGURE 7. THE CENTERS OF SEPTORIA LEAF SPOT LESIONS BECOME DOTTED WITH FUNGAL FRUITING BODIES (PYCNIDIA).

----- Distinguishing Symptoms & Signs -----

Early Blight

Lesions with a target-like appearance due to concentric rings of light and dark brown.

Septoria Leaf Spot

Tan to grey spots with dark brown margins; tiny black dots (fungal fruiting bodies) in spot centers.

CAUSES & DISEASE DEVELOPMENT

Early Blight

Early blight is caused by the fungal pathogen *Alternaria linariae* (formerly *A. tomatophila*). It overwinters on infected plant debris left behind in cropping areas, on seeds, and in common weeds. Initial infections via spores often develop during periods of mild, rainy weather, conditions which favor further spore production. The optimum temperature range for infection is 28° to 30°C (82° to 86°F). However, even with less favorable conditions, lesions may be visible about 7 days after infection. Spores are mainly disseminated short distances by wind and rain splash; however, human contact and equipment can also aid in pathogen spread. Fruit infected in the field can develop symptoms in storage and shorten shelf-life.

Septoria Leaf Spot

Septoria leaf spot is caused by the fungus *Septoria lycopersici*. Plant debris in the field and weeds serve as sources of inoculum from year to year. This fungus can be spread by workers, equipment, and insects moving through wet foliage, as well as rain splashing spores from leaf to leaf. Symptoms can be visible within 6 days of infection. Septoria can also persist on wood and metal equipment, such as plant stakes and cages.

DISEASE MANAGEMENT

Cultural Practices

- Rotate away from tomato, potato and other nightshade crops for at least 2 years.
- Plant tomato varieties with tolerance to Septoria leaf spot and early blight (see TABLE 1).
- Manage weeds (particularly those in the nightshade family) that may serve as secondary hosts for the pathogens.
- Reduce the length of time that leaves are wet (to minimize a disease-favorable environment):
 - Use wider plant spacing.
 - Orient rows in the direction of prevailing winds.
 - Choose planting sites with optimal early morning sunlight and good air circulation.
 - Prune leaves below the oldest fruit cluster on select varieties.
 - Avoid use of overhead irrigation.
- Use mulch under plants to reduce contact between foliage and the soil.

TABLE 1. TOMATO VARIETIES WITH SOME TOLERANCE TO SEPTORIA LEAF SPOT AND EARLY BLIGHT.

(SOURCE: CORNELL VEGETABLE WEBSITE).

Tomato Type	Cultivar	Tolerance	
		Early Blight	Septoria
Cherry*	Green Doctors Frosted	X	
	Jasper F1	X	X
	Matt's Wild (Heirloom)	X	
	Mt. Magic F1	X	
	Super Sweet 100 F1	X	
	Tommy Toe (Heirloom)	X	
	Heather		X
Grape*	Honey Bunch F1	X	
	Valentine F1	X	
	Virginia Select		X
Heirloom	Aosta Valley	X	
	Brandywine	X	
	Marnero F1	X	
	Green Zebra		X
Plum	Indigo Rose	X	
	Juliet F1	X	X
	Plum Dandy	X	
	Plum Regal F1 (Roma)	X	
	Verona F1	X	
Slicer (mostly)	Defiant F1	X	
	Iron Lady F1	X	X
	Mt. Fresh Plus F1	X	
	Mt. Merit F1	X	
	New Yorker	X	
	Old Brooks	X	
	Stellar F1	X	X
	Tropic	X	
Wisconsin 55	X		

*Cherry, grape, and hybrid varieties generally tend to be more tolerant to these diseases than slicer, plum, or heirloom types.

- Follow good sanitation practices (clean equipment and remove or bury all plant debris at the end of the season) in order to reduce the amount of overwintering inoculum for the following season.

Chemical Management

Numerous fungicides are labeled for use against Septoria leaf spot and early blight. Regular application intervals are critical to adequate disease management. A selection of these fungicides and their FRAC codes are shown in TABLE 2. When developing a fungicide program, ensure products are alternated by FRAC code.

TABLE 2. FUNGICIDES LABELED FOR THE MANAGEMENT OF SEPTORIA LEAF SPOT AND EARLY BLIGHT IN TOMATO.

(SOURCE: UK VEGETABLE PRODUCTION GUIDE FOR COMMERCIAL GROWERS (ID-36) & SOUTHEASTERN U.S. VEGETABLE CROP HANDBOOK)

FRAC Group	Product	Expected Efficacy	
		Early Blight	Septoria
3	Mettle	G	G
3	Rhyme	G	ND
7	Endura	G	ND
7	Fontelis	G	F
9	Scala	F	ND
11*	Reason	F	P
11*	Quadris	E	G
11*	Cabrio	E	G
19	Ph-D	F	ND
27	Curzate	NC	ND
11*+ 27	Tanos	F	F
11*+ 3	Quadris Top	G	G
11*+ 3	Topguard EQ	G	ND
11*+ M3	Dexter Max	G	ND
22 + M3	Gavel	F	F
27 + M5	Ariston	F	F
3 + 40	Revus Top	F	F
3 + 9	Inspire Super	E	F
4 + M5	Ridomil Gold Bravo	P	F
7 + 11*	Luna Sensation	E	ND
7 + 12	Miravis Prime	E	E
7 + 3	Aprovia Top	E	F
7 + 9	Luna Tranquility	E	F
9 + 12	Switch	F	NC
M1	Fixed coppers	F	F
M1 + M3	ManKocide	F	F
M3	Ziram	F	F
M3	Mancozeb	F	F
M5	Chlorothalonil	F	F
M5 + U15	Orondis Opti	P	NC

Efficacy ratings: E= Excellent; G=Good; F= Fair; P=Poor; NC=No Control; ND=No Data
Notes

*The early blight fungus (*Alternaria linariae*) has developed resistant to FRAC 11 fungicides in some areas. FRAC 11 fungicides are not recommended if they historically have provided poor control.

Fungicides with no control for either disease = Actigard, Blocker, Forum, Myclobutanil, Orondis Gold, Orondis Ultra, Presidio, Previcur Flex, Ranman, Ridomil Gold/Copper, Ridomil Gold MZ, Streptomycin, Sulfur and Zampro. Zing! had no available data.

ADDITIONAL RESOURCES

- IPM Scouting Guide for Common Pests of Solanaceous Crops in Kentucky
<http://www2.ca.uky.edu/agcomm/pubs/id/id172/id172.pdf>
- Vegetable Production Guide for Commercial Growers, ID-36 (University of Kentucky)
<http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf>
- Compendium of Tomato Diseases and Pests (The American Phytopathological Society)
<https://apsjournals.apsnet.org/doi/book/10.1094/9780890544341>
- Disease-resistant Tomato Varieties (Cornell University Vegetable website)
<https://www.vegetables.cornell.edu/pest-management/disease-factsheets/disease-resistant-vegetable-varieties/disease-resistant-tomato-varieties/>
- Early Blight of Tomato (University of Minnesota Extension)
<https://extension.umn.edu/diseases/early-blight-tomato>
- Early Blight of Tomato (North Carolina State Extension)
<https://content.ces.ncsu.edu/early-blight-of-tomato>
- Southeastern U.S. Vegetable Crop Handbook (Southeastern Vegetable Extension Workers)
<https://content.ces.ncsu.edu/southeastern-us-vegetable-crop-handbook>

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