

## Alternaria Leaf Spot of Tomato: What Growers Need to Know.

**Name of Disease:** Early Blight in Tomatoes

**Pathogen:** *Alternaria linariae*/ *Alternaria tomatophila* (Prev. *Alternaria solani*)

**Host Plants:** Tomato (*Solanum lycopersicum*)

### Typical Symptoms (How to identify the disease)

Early blight typically occurs on tomatoes following rainfall and/or moist conditions such as dew. Development can occur in a wide range of temperatures; however, temperatures around 80 degrees Fahrenheit are ideal for development. Initial symptoms are generally present on the lower foliage of the plant. These symptoms first appear as dark brown/blackened spots on the lower foliage. As the disease on these leaves progresses, these initial spots will have concentric rings forming as the lesion. These lesions with the outer yellowing ring cause eventual death to the leaves. The symptoms will progress upward on the plant infecting the more mature leaves. In severe cases of early blight, stems will also form lesions. Symptoms of fruit typically present as brown/black spots near the calyx end (upper half) of the fruit and will also form tell-tale concentric rings.

1. Symptoms of this disease can be seen on foliage and, in severe cases, on the stem as well.
2. Lesions may be first seen on the lower leaves as small brown or light black spots with characteristic concentric rings.
3. The spots may have an outer chlorotic circular zone (yellow halo).
4. In later stages, small lesions may coalesce to each other and cause large portions of the leaves to be blighted.
5. The lesions can be seen on the upper leaves as the disease progresses.
6. Gradual defoliation of blighted leaves can be observed.
7. Early blight spots are larger in size compared to Septoria leaf spots.
8. Generally, the early blight spots have characteristic target-like or concentric rings which is not found in other leaf spot diseases like Septoria leaf spot symptoms



Early blight-infected leaf	Advanced stage of early blight infection on leaves. Notice the large lesions and significant yellowing of the leaves infected with early blight.	Early blight lesion present on the tomato stem. Notice the concentric ring formations inside the lesion, which is characteristic of early blight infection.
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### **Disease cycle and epidemiology**

Early blight infection starts with the germination of conidia/spores on the leaf tissues once humid and warm conditions are present. This germination process will start with germ tube germination and invasion into tissues of the host (leaves, stem, fruit). Once infection occurs, symptoms typically follow in 2 or 3 days with the presence of dark-colored lesions typical of early blight infection. The yellowing ring found on the outside of the lesions results from the production of metabolites/toxins secreted by the fungi. Within a week, the infected tissues (lesions) will start to produce conidiophores. Conidiophores, the source of conidia/spores, are produced when nighttime is very damp. Once these structures are produced, a period of light and dry will allow for the production of conidia/spores after another wet night period similar to the conditions required to produce conidiophores. After the production of conidia, disturbances such as wind or rain will spread conidia to continue the disease cycle.

Disease development can be rapid in warmer temperatures generally above 80°F and high humid conditions. Moderate to high rainfall also favors the disease development and spread..

### **Management Strategies**

There are several ways to control early blight infections in tomatoes. These methods can include the use of resistant varieties, cultural practices, and foliar treatments.

#### **Resistant Varieties**

Resistant varieties are a great way to reduce infection rates and yield loss. NC State University has released several tomato varieties that have demonstrated resistance to early blight, including “Mountain Fresh Plus,” “Mountain Merit,” “Mountain Magic,” and “Mountain Supreme.” There are other varieties of tomatoes with resistance to early blight including “Marglobe”, an easily acquired variety. However, choosing disease-resistant varieties is based on observation of disease on varieties as the exact genes conferring early blight resistance have not been determined.

#### **Cultural Practices**

Crop rotation is an important technique to mitigate early blight infections. It breaks the disease cycle, as the conidia can survive for extended periods of time on plant debris from previous seasons. Without rotation, infected material will allow for the presence of greater amounts of disease inoculum within the growing environment.

Utilizing mulching practices can also reduce infection rates of early blight in tomatoes. Since spores of early blight can come from splashes of contaminated soil, mulching of the soil surface can minimize early blight infection rates.

Clean cultivation practices like proper pruning, removal, and disposal of crop debris, weeds, and volunteer crops in fields can reduce the inoculum pressure in the field.

Proper fertilization and irrigation are crucial for maintaining the good vigor of plants and help in reducing the susceptibility of plants to various diseases.

### **Biological Management:**

Various biological projects targeting early blight, *Trichoderma spp.*, *Bacillus spp.*, and *Streptomyces spp.*, can be a good option for organic growers to keep this disease under control. For more details and products, see **Vegetable Crop Handbook for Southeastern United States 2024**.

### **Further reading:**

- Panthee, D. R., Pandey, A., & Paudel, R. (2024). Multiple Foliar Fungal Disease Management in Tomatoes: A Comprehensive Approach. *International Journal of Plant Biology*, 15(1), 69-93. <https://doi.org/10.3390/ijpb15010007>
- Adhikari, P., Oh, Y., & Panthee, D. R. (2017). Current Status of Early Blight Resistance in Tomato: An Update. *International journal of molecular sciences*, 18(10), 2019. <https://doi.org/10.3390/ijms18102019>

### **Authors:**

#### **Rajan Paudel**

Graduate Student (Ph.D.)

Department of Entomology and Plant Pathology

#### **Anju Pandey**

Graduate Student (Ph.D.)

Department of Horticultural Science

#### **Wayne Morgan**

Field Technician

Mountain Horticultural Crops Research and Extension Center

#### **Dilip R. Panthee**

Associate Professor (Tomato Breeding Program)

Mountain Horticultural Crops Research and Extension Center

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