



# AGRONOMIC SPOTLIGHT



## TARGET SPOT OF TOMATO

- » Target spot is one of the most important diseases of tomato in tropical and subtropical regions.
- » Symptoms of target spot can be confused with those of bacterial spot and early blight.
- » Cultural practices and fungicide applications are used to manage target spot of tomato.

### IMPACT OF TARGET SPOT

Target spot of tomato is caused by the fungal pathogen *Corynespora cassiicola*.<sup>1</sup> The disease occurs on field-grown tomatoes in tropical and subtropical regions of the world. Target spot was first observed on tomatoes in the U.S. in Immokalee, Florida in 1967. The disease distribution in the U.S. is limited to the southeastern region, most predominantly in the southern parts of Florida.<sup>2,3,4</sup> However, the disease also occurs on tomatoes grown in greenhouse and high tunnel production systems in other areas of North America.<sup>5</sup>

Target spot infections reduce yield indirectly by reducing the photosynthetic area and directly by reducing the fruit's marketability through fruit spots. One study documented a 30% reduction in marketable yield and a 43% reduction in extra-large fruit when comparing production from treated and untreated plants. In some untreated plots, two-thirds of the fruit were discarded because of fruit blemishes.<sup>7</sup>

The pathogen *C. cassiicola* has a wide host range, infecting more than 500 species of plants, including cucumber, cotton, soybean, papaya, and several ornamental and weed hosts.<sup>1,4,8</sup> Tomato plants have been infected with strains of the pathogen isolated from other hosts in greenhouse tests. However, some isolates of the pathogen have shown some host specificity while others have a wider host range. The fungus functions as a necrotroph (killing tissue as it infects), a saprophyte (surviving on plant debris), and as an epiphyte (growing on but not infecting plant tissues). Epiphytic colonization of weeds can provide inoculum for tomatoes.<sup>8</sup>

### SYMPTOMS

The target spot fungus can infect all above-ground parts of the tomato plant. Plants are most susceptible as seedlings and just before and during fruiting. The initial foliar symptoms are pinpoint-sized, water-soaked spots on the upper leaf surface (Figure 1a). The spots develop into small, necrotic lesions that have light brown centers and dark margins. These symptoms may be confused with symptoms of bacterial spot.<sup>1,2,8</sup> The lesions increase in size, become circular with gray to pale brown centers. As the lesions enlarge, they can develop darker concentric circles, hence, the name target spot (Figure 1c). The concentric circles are similar to those seen on early blight

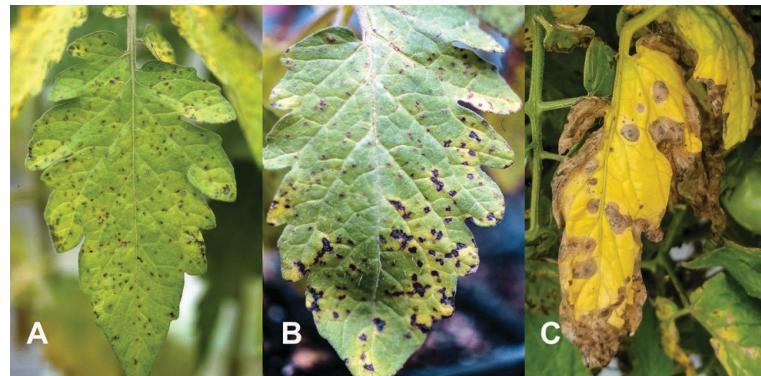


Figure 1. The progression of foliar symptoms of target spot of tomato from (A) initial to (B) intermediate to (C) advanced stages of the disease. Image (C) courtesy Gary Vallad, University of Florida.

lesions. Yellow halos can form around the lesions on some varieties. Lesions can coalesce, forming large blighted areas on the leaflets, and infected leaves may drop prematurely.<sup>4,5,6,8</sup> Target spot infections typically start on the older, lower leaves in the inner canopy. Thus, the initial symptoms may not be noticed by the grower, making early detection difficult. The disease progresses upward, causing defoliation of the inner canopy, a condition known as "melting-out".<sup>1,2,6,9</sup>

Initial symptoms on stems and petioles are pinpoint lesions that become brown and elongated to oblong. The lesions can expand to the point where they girdle the stem or petiole, resulting in the collapse of leaves or leaflets.<sup>2</sup> The lesions on the fruit start as slightly sunken, brown flecks. The fruit lesions enlarge (Figure 2a), forming large, circular, sunken craters with pale-brown centers and concentric circles (Figure 2b). The tissue in the fruit lesions may crack with time.<sup>1,2,8</sup> When severe, numerous leaf and stem lesions form on plants, causing collapse of tissues and, eventually, plant death.

### CYCLE AND CONDITIONS

The target spot pathogen survives between crops on plant debris and alternate host plants, including weed hosts. The fungus produces spores, which are spread by wind and wind-blown and splashing rain.<sup>2,6,9</sup> Infection of tomato plants requires high humidity levels, periods of leaf wetness from 16 to 44 hours and temperatures between 60° and 90°F. Optimal

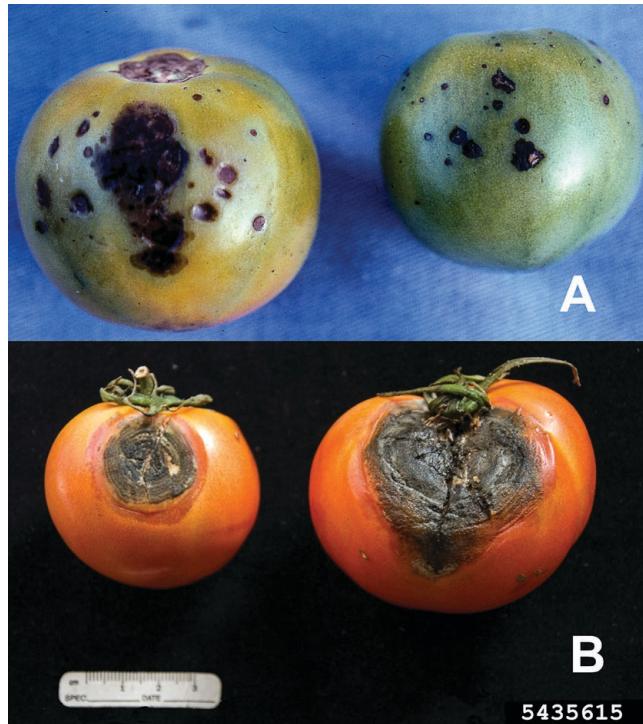
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**Figure 2.** Symptoms of target spot on tomato fruit. (A) Developing lesions on younger fruit. (B) Older lesions on mature fruit. Image (B) courtesy of Yuan-Min Shen, Taichung District Agricultural Research and Extension Station, Bugwood.org.

disease development occurs at temperatures between 68° and 82°F.<sup>2,8</sup> Target spot tends to be more severe on plants with lush canopies that dry more slowly. Fruit wounded by hail or blowing sand are predisposed to infection.<sup>1,4,8</sup>

## MANAGEMENT

Cultural practices for target spot management include improving airflow through the canopy by wider plant spacing and avoiding over-fertilizing with nitrogen, which can cause overly lush canopy formation. Pruning suckers and older leaves in the lower canopy can also increase airflow and reduce leaf wetness.<sup>1,5,9</sup> Avoid planting tomatoes near old plantings. Inspect seedlings for target spot symptoms before transplanting. Manage weeds, which may serve as alternate hosts, and avoid the use of overhead irrigation. Destroy crop residues shortly after the final harvest, and rotate away from tomato and other known hosts for at least three years. Resistance to target spot is not available in commercial tomato varieties, although partial resistance has been observed in wild species of tomato.<sup>2,8</sup>

The primary strategy used to manage target spot on tomato is the regular application of fungicides. Applications should begin before symptoms appear when conditions are favorable for infection and disease development. Fungicides may need to be applied at regular intervals (every 10 to 14 days is common)

depending on the label directions of the products used. Full coverage of all plant surfaces is needed for the best control of target spot.<sup>1,2,8,9</sup>

Many fungicides are registered to control of target spot on tomatoes. Growers should consult regional disease management guides for recommended products.<sup>10</sup> Products containing chlorothalonil, mancozeb, and copper oxychloride have been shown to provide good control of target spot in research trials.<sup>1,9</sup> The strobilurin fungicides azoxystrobin and pyraclostrobin, the fungicide boscalid, and the systemic acquired resistance (SAR) elicitor acibenzolar-S-methyl have also been shown to provide good control of target spot.<sup>4,11</sup>

The labels of many of the fungicides registered for target spot control indicate that the products should be tank-mixed or alternated with fungicides with different modes of action to prevent the development of fungicide-resistant strains of the target spot pathogen. This is especially important when using strobilurin fungicides because they are at high risk for resistance development. Strains of *C. cassicola* that are resistant to strobilurin fungicides have been detected in tomato and other crops.<sup>2,4,8</sup> Successful, long-term management of target spot on tomato will require the use of integrated programs that include cultural and chemical management strategies.

## Sources:

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**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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