

# Strawberry disorder: Angular leaf spot

P. S. M c M A N U S

Angular leaf spot, caused by *Xanthomonas fragariae*, is the only important bacterial disease affecting strawberry. First reported in Minnesota in the early 1960s, it has since been found throughout North America and in Africa, Australia, Europe, New Zealand, and South America. The disease has been introduced into new areas on infected plants and is a major economic concern for nurseries, especially those involved in international trade. International plant health organizations have listed angular leaf spot as a disease of increasing importance and have implemented quarantine measures to curtail further spread of *X. fragariae*. The economic importance of angular leaf spot to growers has not been well-documented. Severely infected leaves might lead to decreased plant vigor and yield. Direct yield loss can occur if peduncles (fruit stems) and calyxes (leaf-like hulls on fruit) become infected.

## Symptoms

Leaf spots first appear on the lower surfaces of leaves as tiny, water-soaked lesions that are delimited by veins. The angular spots appear yellow to pale green and translucent when held up to light, but dark green and opaque when viewed from above. Under wet conditions, a slimy white film often oozes from the spots. Upon drying, this film becomes scaly, and white flakes can be easily scraped from the leaves. As the disease progresses, spots become more numerous, merge, and become visible on the upper surfaces of leaves as reddish-brown dead areas. The edges of leaves may appear ragged as dead tissue breaks off. At advanced stages, angular leaf spot is difficult to distinguish from fungal leaf-spotting diseases such as common leaf spot (*Mycosphaerella fragariae*) and leaf scorch (*Diplocarpon earliana*).

While leaf lesions are the most common symptom of angular leaf spot, the bacteria can also infect the calyx. Calyx infection causes direct losses as it makes fruit unmarketable. Infected calyx tissue first appears dark green and water-soaked but later turns black. Fruit tissue nearest the calyx becomes water-soaked. *X. fragariae* can move into the roots, crowns, and stolons without showing obvious symptoms. This type of infection can cause sudden collapse and death of plants.



**Infection of calyx tissue makes berries unmarketable.**



**On the lower leaf surfaces, angular leaf spot initially produces dark green, water-soaked areas which later become brown and dry.**



**Leaf spots appear light green when leaves are held up to light.**

## Disease cycle

The pathogen overwinters in leaf debris in or on top of the soil and apparently infects new leaves as they emerge in the spring. The pathogen can also persist in the crowns of infected plants and systemically invade emerging tissue. Disease development is favored by cool to moderate daytime temperatures (65–70°F; 18–21°C), cold nighttime temperatures (near freezing), high relative humidity, and wet conditions brought on by rain, irrigation, or dew. The white, slimy film on leaf lesions contains the pathogen and is spread within a planting by splashing rain and overhead irrigation water. Young, vigorously growing tissue is highly susceptible to infection. Bacterial populations and symptoms subside during hot, dry weather, but then rebound when temperatures become cool in the fall. *X. fragariae* apparently does not infect plants other than strawberry.

## Control

Angular leaf spot is a threat if *X. fragariae* is present in a strawberry planting and the environment is favorable for infection and disease development. Thus, the best strategy for controlling this disease is avoidance of the pathogen. Plants should be purchased from a reputable nursery and closely inspected for symptoms. However, be aware that plants can carry the pathogen without showing symptoms. DNA-based detection methods may permit nurseries to screen stock more rigorously in the future and reduce the risk of selling contaminated plants.

Because *X. fragariae* survives in leaf debris, new plantings should not be established in soil containing infected leaves or near infected plants. Fixed copper compounds applied as directed on product labels may reduce bacterial populations and protect tissue from infection. However, chemical control of angular leaf spot has been inconsistent. Copper is active on the surfaces of plants but will not eliminate infections and probably does not affect systemic movement of the pathogen. Resistance of commercial cultivars of strawberry to angular leaf spot is not known.

## Additional information

For more information on related topics, see the following publications available from your county Extension office:

*Growing Strawberries in Wisconsin* (A1597)

*Strawberry and Raspberry Pest Management in Wisconsin* (A1934)  
Current recommendations for commercial growers

*Strawberry Pest Management for Home Gardeners* (A2127)

*Strawberry Disorder: Black Root Rot* (A3231)

*Strawberry Disorder: Strawberry Gray Mold* (A3232)

*Strawberry Disorder: Leaf Spot and Leaf Scorch* (A3233)

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