



Strawberry Leaf Diseases– Identification and Management

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Identification of Leaf Diseases

Leaf Spot (caused by the fungus *Mycosphaerella fragariae*)

On leaves: Look for small round purple to reddish spots on upper leaf surfaces. Centers of these spots become light tan to grey to white with age, with narrow reddish purple to brown borders; centers of the spots may dropout giving the leaves a “shot-hole” appearance.

On fruit: “Black seed disease” occurs occasionally in heavily infected plantings. One to two black spots form on the surface of ripe berries under groups of up to 8 to 10 seeds. No fruit rot occurs below the spots but fruit are generally considered unmarketable due to appearance.

Other plant parts infected: leaf stems (petioles), runners, fruit stalks (pedicels), flowers, berry caps (calyxes). Symptoms are almost identical to those described on leaves.

Conditions favoring infection: Spores (conidia) are produced in spring on overwintering and dead leaves. They are rain-splashed onto newly growing leaves, stems, flowers and fruit. Infections occur during periods of leaf wetness lasting 12 to 96 hours and temperatures between 59 and 68 °F.



Leaf Scorch (caused by the fungus *Diplocarpon earliana*)

On leaves: Spots may have 2 shapes; small pinpoint spots in large or small numbers and/or ¼ to ½” diameter blotchy spots. Scorch spots are typically reddish brown and often fuse together. As the disease progresses the leaves brown, wither and curl, becoming “scorched” in appearance. *Note the centers of these spots do not become white, brown, or gray, as with leaf spot or leaf blight.*



On berry caps: “dead cap”, “dead burr”. Irregular brown spots form on the berry caps, often from the margins or tips of the caps inward. No fruit rot occurs but fruit are generally considered unmarketable due to appearance.



Other plant parts infected: leaf stems (petioles), fruit stalks (pedicels), flowers, berry caps (calyxes). Flower and fruit trusses may be girdled and die. Severe leaf scorch infections reduce vegetative growth and fruit yield the season *after* infection. Scorch also reduces both numbers and vigor of crowns; highly infected plants may die when stressed by heat, cold or drought.

Conditions favoring infection: Spores (conidia) are produced in spring on overwintering and dead leaves. They are splashed onto newly growing plant tissue by rain, heavy dew or overhead irrigation. Infections occur during periods of leaf wetness lasting 9 hours or more and temperatures between 59 and 86 °F. Leaf scorch infections may occur year round but hot dry conditions (>95°F) and temperatures below freezing reduce the rate of disease.

Leaf Blight (caused by the fungus *Phomopsis obscurans*)

On leaves: *Large, nearly circular spots with wide reddish purple margins and brown centers. Lesions (spots) from the leaf margin may also be V-shaped toward the mid-vein.*



On fruit: *Phomopsis soft rot* has not yet been reported in New York but does occur in Ohio and southern states to Florida. The disease affects ripening or fully matured fruits. Early symptoms are round, pink, water-soaked

spots. Later these enlarge and turn brown with a “crusty” appearance. The crusty appearance is due to formation of clusters of tiny spore producing structures called pycnidia. These can be seen with a 10x hand lens or magnifying glass. Later stages of Phomopsis soft rot resemble those of anthracnose except anthracnose spots on fruit do not have a crusty appearance but rather develop salmon-colored ooze under moist conditions.



Other plant parts affected: leaf stems (petioles), runners, fruit trusses (pedicels) may be girdled, collapse and die. Severely diseased plants may not yield well. Plants weakened from Phomopsis may be more susceptible to winter injury.

Conditions favoring infection: Spores (conidia) are produced on overwintering and dead leaves. They are rain-splashed onto newly growing plant tissue in spring. The fungus is capable of causing infection over a wide range of temperatures (50 to 95 °F). Research indicates disease development is influenced more by wetting period length (6 to 15 hours) than temperature. Infections typically occur early in the season but remain latent until warmer weather with symptoms appearing during harvest or after renovation in late summer to early fall. *Note leaf blight does not readily infect fruit caps.*

Powdery Mildew (caused by the fungus *Podosphaera macularis*)

On leaves: White powdery patches typically develop on the lower surfaces of leaves first and may go unobserved until leaf margins begin to curl upward.

These patches may enlarge and cover the entire leaf undersurface. Purple to reddish blotches may also occur on the lower leaf surface as a result of infection. Upper surfaces may have powdery patches as well. Numerous small dark round overwintering structures (cleistothecia) may appear on leaves in fall.



On fruit: Powdery mildew may infect flowers, causing them to produce hard dry, misshapen fruit; older fruit may also be colonized giving them a seedy look. Both types of infection reduce fruit quality and marketable yields.

Other plant parts infected: leaf stems (petioles), flower trusses (pedicels). Severe leaf infections damages leaves, reducing their ability to photosynthesize; leaves may eventually die and drop off depending on the



severity of infection. This in combination with infections of flowers and fruit may have a serious effect on yield.

Conditions favoring infection: Unlike the leaf spot fungi, which are favored by the presence of free water on plant surfaces, the powdery mildew fungus is inhibited by wet, rainy conditions. Disease develops best under conditions of moderate to high humidity and warm temperatures (60 to 80°F). This fungus also differs from the leaf spot fungi in that it is an obligate parasite requiring living host tissue to survive; thus it overwinters only in infected living tissue (crowns and leaves). Infected transplants may be a major source of disease initiation in a new planting.

Angular Leaf Spot (caused by the bacterium *Xanthomonas fragariae*)

On leaves: Angular leaf spot appears first as tiny water-soaked spots (lesions) on the lower leaf surface. These enlarge to form angular lesions, restricted by small leaf veins. The young spots are usually best viewed on the underside of the leaf and appear translucent when looked at with a light source behind them and dark green when viewed normally. This difference is an important distinguishing characteristic in identifying the disease. Spots eventually become visible on the upper leaf surface and appear as irregular, reddish brown spots. These may grow together to cover large leaf areas, causing infected leaves to appear scorched or blighted closely resembling leaf spot and leaf scorch. Dead tissue becomes dry and brittle, breaking off; giving leaves a frayed or ragged look. Heavily infected leaves may die if the bacterial infection moves into major veins.

On fruit: When infections of angular leaf spot become systemic, the berry cap (calyx) may also be infected. The modified leaves of the berry cap (sepals) darken and dry. This reduces the marketability of the fruit.

Other plant parts affected: Systemic infections may occur, with all types of plant tissue including the crown being infected. In severe cases, a decline similar to that caused by *Phytophthora cactorum* or anthracnose crown rot may develop. Water soaking at the base of newly emerging leaves may be the only visible



symptoms to be expressed before the plant suddenly dies.

Conditions favoring infection: Moderate day time temperatures (68 °F) accompanied by low to near freezing night-time temperatures (36-39°F) and precipitation events such as heavy rain or dews or overhead irrigation used for frost protection.

Management of Leaf Diseases

Leaf Spot, Leaf Scorch, Leaf Blight

General management information: Frequent rains, overhead irrigation, and heavy dews favor disease development and spread. Promote good air circulation for rapid drying of leaves and fruit by using recommended in-row and between-row plant spacings and keeping plantings well-weeded. Minimize the use of overhead irrigation; consider installing a drip irrigation system and using floating row cover for frost protection instead.

Whenever possible choose varieties that are resistant or tolerant to leaf diseases. Remove and destroy dead leaves at renovation. Apply nitrogen fertilizers only after renovation or in the fall to reduce chance of infection; applications of nitrogen in the spring produce an overabundance of young leaf tissue susceptible to leaf-disease fungi.

New plantings or plantings with history of disease: Apply a protectant spray in early spring as new leaves begin to unfold and again before conditions that favorable for disease occur (check product labels for recommended intervals between sprays). Begin sprays again after renovation to protect new foliage from infection. Thorough coverage is necessary for good control; it is especially important to cover undersides of leaves as well as surfaces.

Leaf Spot

Conventional Products: Cabrio EG, Captan 50WP, Captan 4L, Captec 4L, Pristine, Rally 40WSP, or copper (several formulations).

Organic Products: Basic Copper 53, Nu-Cop 50DF and 50WP, or Badge X₂.

Leaf Scorch

Conventional Products: Topsin-M 70WSP, or copper (several formulations).

Organic Products: Badge X₂; check with certifier for allowable copper formulations.

Leaf Blight

Conventional Products: Agristar Sonoma 40WSP or Rally 40WSP, Topsin-M 70WP, or copper (several formulations).

Organic Products: Nu-Cop 50DF and 50WP, or Oxidate.

Powdery Mildew

General management information: Whenever possible choose varieties that are resistant or tolerant to powdery mildew. Infected transplants may be a major source of disease initiation; plant only clean plant material from certified nurseries. Ask your nursery about their powdery mildew management program for transplants. Note the standard practice of removing leaves from transplants during harvest and packing will also help reduce disease in new plantings although some powdery mildew may be present on crowns.

New plantings or plantings with history of disease: It is important to begin management at the very first sign of disease in the field and continue applications as long as disease development continues (see product labels for recommended spray intervals). Effective control of powdery mildew in the fall will reduce disease development in the spring; reduction of powdery mildew development on leaves will also aid in reducing fruit infections.

Conventional Products: Abound, Cabrio EG, Organic JMS Stylet Oil, Pristine, Quintec, Rally 40WSP or Agristar Sonoma 40WSP, Rampart, Topsin 4.5L, Microthiol Disperss or Kumulus DF.

Organic Products: Actinovate-AG, Kaligreen or Milstop, Kumulus DF, Oxidate, or Organic JMS Stylet Oil.

Angular Leaf Spot

General management information: Frequent rains, overhead irrigation, and heavy dews favor disease development and spread. Promote good air circulation for rapid drying of leaves and fruit by using recommended in-row and between-row plant spacings and keeping plantings well-weeded. Minimize the use of overhead irrigation; consider installing a drip irrigation system and using floating row cover for frost protection instead.

Begin applications when symptoms occur. Continue on a weekly basis until conditions no longer favor disease development; discontinue applications if signs of crop injury appear. Thorough coverage is necessary for good control; it is especially important to cover undersides of leaves as well as surfaces.

Conventional Products: Kocide DF or Badge X₂.

Organic Products: Badge X₂ or Oxidate.

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