

Raspberry Diseases

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Raspberries grown in Minnesota are commonly infected by a variety of fungal and viral diseases, which vary in expression, severity, and frequency. These diseases have the potential to limit fruit quality, yield, and stand longevity.

The most common fungal diseases include anthracnose, cane blight, spur blight, and botrytis fruit rot commonly called 'gray mold.' These diseases can cause defoliation, wilting of lateral shoots, death of fruiting canes, and a reduction in winter hardiness. Other diseases such as phytophthora root rot, powdery mildew, rust fungi, fireblight, leaf spot, and verticillium wilt can also infect raspberry stands, but are not usually considered as important or life threatening. The severity of each disease fluctuates yearly, depending on annual weather conditions and cultural practices.

To maximize raspberry production, plant disease-resistant or fall-bearing cultivars such as Heritage and Autumn Bliss on an appropriate site, and follow a thorough disease-management program. Frequent scouting and knowledge of the common diseases will help identify the correct disease organism and appropriate control measures. Many of the common diseases can be minimized or eliminated with cultural practices and sanitation, since most disease-causing organisms survive winter on infected plant material. However, other diseases will require fungicide applications. To promote healthy raspberry stands and reduce plant disease, follow these cultural practices.

- Start with disease-free and virus-tested raspberry plants from a reputable nursery. (For more information on cultivar selection, see extension publication FS-1108-A, *Raspberries for the Home Garden*.)
- Plant raspberries in well-drained soil or raised beds.

- Avoid overhead irrigation, over-fertilizing, and wounding plants.
- Control weeds within and around the raspberry stand.
- Prune and thin canes annually during dry weather to maintain optimum spacing and row widths.
- Destroy abandoned and wild brambles surrounding the raspberry stand, since they harbor disease-causing organisms.
- Remove newly infected canes and destroy.
- Remove old fruiting canes (after harvest) and destroy.

Fungal and Bacterial Diseases

ANTHRACNOSE is frequently observed on the canes of black raspberry and susceptible cultivars of red raspberry. In late spring, red-purple oval lesions



Anthracnose on the leaves and cane. Small, brown spots develop on the leaves, while gray, oval spots with dark margins develop on the cane.

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appear on the primocanes. The center of these lesions later turns pale brown to ash gray, while the margins become raised and purple. Lesions usually girdle the cane causing it to die, dry, and crack. Infected primocanes that survive winter usually produce irregular, lateral branching and irregular fruit.

Surviving canes may also suffer tip dieback. Spores produced on infected canes during wet periods in the spring initiate new infections. Anthracnose also infects the leaves, flowers, and fruit. Small, purple-brown spots typically develop on infected leaves.

CANE BLIGHT is usually associated with wounded or damaged canes. Spores produced throughout the growing season on previously infected floricanes are rain splashed to healthy primocanes, where new infections begin. Primocanes that survive the winter rapidly wilt and die the following season. Visual symptoms are typically expressed the following spring as lesions on the floricanes. These lesions appear black, brown, or gray and contain black pimple-like pycnidia. Lesions often extend through several internodes on one side of the cane. Infected canes tend to be brittle and often break near the lesion. Cane blight causes wilting, death of axillary buds and lateral branches, and death of the cane.

SPUR BLIGHT is most frequently observed as lesions surrounding the nodes on primocanes. Infection initially begins along the margins of the leaf and progresses inward, through the petiole, to the stem. Infected primocane leaves develop a brown 'V' shaped lesion with yellow borders, and even-



Spur blight on the cane. Lesions initially appear dark purple to brown, but later turn silver to gray.



Gray mold on fruit. Gray, velvety mass of fungal material covers berry.

tually fall from the plant. Floricane leaves are also susceptible, but rarely infected. Cane lesions appear purple under the heavy primocane wax, but turn brown when the wax is rubbed off. In winter, lesions turn silver to gray and become difficult to identify. In the spring, spur blight causes buds near infected nodes to fail or remain inactive. Infected lateral shoots (spurs) may also show a reduced number of flowers. Spur blight infects only the outer portion of the stem (cortex), so healthy green tissue can be found beneath the lesion.

GRAY MOLD, a common and serious disease of raspberries, causes blossom blight and fruit rot. Gray mold can also infect senescing leaves and canes. Infection typically begins on young flowers, but quickly spreads to fruit during cool, wet weather. Often immature berries, with latent infections, remain symptomless until the fruit matures. However, when environmental conditions are cool and wet, infected berries may become covered by a mass of gray or brown fungal material. This mass of fungal material gives fruit a moldy appearance. Physical damage, bruising, or wounding causes an increase in the number of fruit infections and post harvest rot. Cool, wet weather prior to and during harvest also increases the chance for rot.

PHYTOPHTHORA ROOT ROT is caused by a soilborne fungus that commonly infects the roots of red raspberries. This disease causes the leaf margin to appear yellow, wilted, or scorched. Infected canes may wilt and die rapidly or remain symptomless until the following year. Infected plants may

contain dark water-soaked lesions near the base of the cane or reddish-brown root tissue. *Phytophthora* can persist in the soil for many years and is stimulated by wet, saturated soils.

VERTICILLIUM wilt is a soilborne fungus that infects the vascular tissue of raspberries. This disease typically causes wilting, stunting, and death of fruiting canes, while severe infections may cause death of the entire plant. Sapwood of infected canes is often stained red-brown. *Verticillium* also persists in the soil for many years.

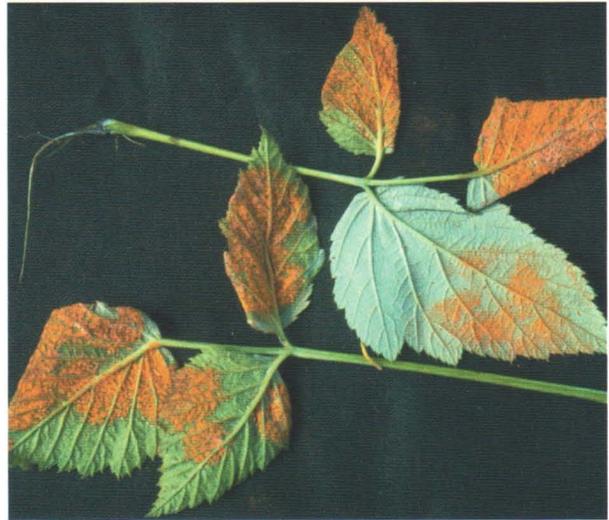
FIREBLIGHT, although uncommon and of little concern on raspberry, can cause fruit loss and shoot death. Canes of infected plants first appear water soaked or dark green in color. Canes may later turn purple to black and curl at the tip (Shepherd's Crook). Fireblight, a bacterial disease, may ooze from cracks on infected canes.

RASPBERRY LEAF SPOT occurs on the upper surface of the leaf as white, gray, or tan spots. Sometimes the center of the lesion falls out leaving a shot-hole appearance to the leaf. Heavily infected leaves may fall prematurely, increasing the plants susceptibility to winter injury. Leaf spot symptoms are often confused with similar symptoms of raspberry anthracnose. To differentiate these two diseases, examine the stems closely for lesions, which indicate the presence of raspberry anthracnose.



Leaf spot on raspberry. Tan, circular spots on the upper leaf surface are easily confused with symptoms of raspberry anthracnose.

POWDERY MILDEW usually appears on the bottom side of leaves as a white to gray powdery growth. This disease may occur yearly, but is not considered a serious problem.



Rust on raspberry leaves. Powdery, orange growth on the underside of the leaves.

RUST FUNGI appear on the upper and lower leaf surface as orange-yellow spots. Several rust fungi commonly infect the leaves and canes, while only a few fungi are able to infect fruit. Rust fungi are fairly common, but do not typically affect the overall health of the plant. However, one fungus, commonly known as orange rust, is considered a serious threat to black raspberries. Red raspberries are immune. Orange rust is a systematic disease that survives winter in newly formed roots, causing new infections the following year.

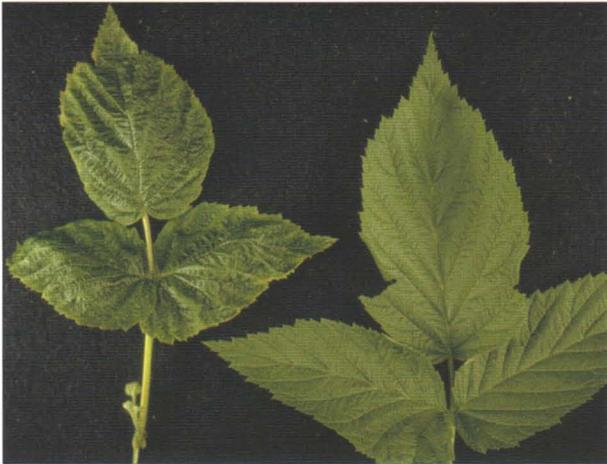
Fungal and Bacterial Disease Management

To properly manage fungal diseases, begin with the cultural practices previously listed. Fungicide control is available for anthracnose, cane blight, and spur blight. A dormant season application of lime sulfur can be applied in early spring as the buds begin to swell, but before leaves appear. Sulfur and copper-based fungicides are the only other chemicals available for homeowner use.

Most of the remaining diseases do not require fungicide applications. To control severe verticillium infections, destroy infected plants and establish a new stand in a different location. To control fireblight, prune out and destroy infected canes. Sterilize pruning tools in between each cut with a 10% bleach solution or 70% alcohol. To control orange rust, remove and destroy infected raspberry plants. A laboratory examination is recommended before removing infected plants.

Viral Diseases

Viral diseases, although less prevalent than fungal diseases, are considered more damaging. Viral diseases often limit both the yield and longevity of a raspberry planting. The most common viral diseases found in Minnesota include raspberry mosaic, leaf curl, and tomato ringspot.



Viral infected leaf (left) and healthy leaf (right). Infected leaflets appear stunted, curled, and distorted.

RASPBERRY MOSAIC DISEASE typically causes yellow-green leaf mottling, leaf blistering, leaf tip browning, and/or stunting. Raspberry mosaic disease can also infect plants without expressing any visual symptoms. Raspberry mosaic disease is caused by a complex of viruses and transmitted by the large raspberry aphid. Severe infection causes a reduction in stand vigor, fruit quality, winter hardiness, and stand yield.

RASPBERRY LEAF CURL VIRUS typically causes curling and distortion of dark green leaves. Infected plants appear stunted and contain excessive branching. Infected fruit is usually small, crumbly, and seedy. This disease is spread slowly by the small raspberry aphid. Severe infection causes a reduction in yield, fruit quality, and winter hardiness.

TOMATO RINGSPOT VIRUS is carried to healthy plants through the soil by the root feeding dagger nematode (*Xiphinema* sp.). Yellow rings, line patterns, or veinal chlorosis commonly appear on the leaves of red raspberry plants. However, new leaves are often void of symptoms. Severely infected plants may appear stunted, yield crumbly fruit, produce poor yields, and/or show a reduction in plant health. Tomato ringspot virus can also be dispersed through infected seed.

Viral Disease Management

Viral disease management should begin with the cultural practices previously listed. Although insecticide application may help reduce the number of insect vectors, insecticides are not considered highly effective. However, the cultivar "Nordic" has been shown to be resistant to aphid feeding. If viral diseases have been a problem in the past, it may be necessary to relocate raspberry plantings. The size, location, and age of the planting will also influence disease severity. Pre-planting soil tests should be conducted for sites with previous or questionable nematode activity. For more information on nematode testing, contact the University of Minnesota, Department of Plant Pathology, Plant Disease Clinic.

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