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Fungus Diseases Affecting the Leaves and Canes of Raspberries in Idaho

H. S. Fenwick

Extension Plant Pathologist

Six diseases of fungus origin are known to attack the above-ground portions of raspberries in Idaho. This publication was prepared to help people diagnose and alleviate those diseases.

Everyone interested in growing raspberries should first carefully read Idaho Extension Bulletin No. 419 "Growing Raspberries in Idaho". The suggestions outlined in this bulletin will assist in the control of all the diseases of raspberries that occur in Idaho.

SPUR BLIGHT

This is the most common above-ground fungus disease found in raspberry plantings in Idaho. The disease, **confined primarily to red raspberries**, is most prevalent when considerable intermittent rain falls during the late spring and early summer. The disease can be extremely serious when overhead sprinklers are used.

Symptoms

Reddish-brown to purple spots appear at bud and spur sites on the canes, particularly on young canes. Such spotting is most visible after midsummer. Sometimes wedge-shaped spots or lesions will form on the leaves.

When infection is severe, the region around the buds turns brown, often shrivels and dies. Buds that survive the winter produce only small yellowish leaves, but no spurs and consequently no fruit. Buds near the ground level are most affected.

Leaves on diseased fruiting canes fall prematurely, the canes dry out and may crack. The brown lesions fade to a grayish color during the late fall and early winter.

Cause

Spur blight is incited by the fungus *Didymella applanata*. The fungus develops two distinctly different spore-forming structures. The overwintering stage of the fungus, called *perithecia*, develops in infected cane tissues during the late fall and early winter. The perithecia at first appear as randomly scattered black dots partially submerged below the epidermis. Cracking and sloughing-off of the epidermis during the winter and early spring visibly exposes the perithecia to the observer.



Raspberry canes showing advanced stages of spur blight.

Fungus spores, called *ascospores*, formed in the perithecia are forcibly ejected into the atmosphere only during May through June rainy periods. Some of the spores land on young shoots or leaves. These spores, in the presence of moisture, germinate and penetrate the host. Moisture retention in the region of the buds makes them favorable infection sites for the fungus.

After initial invasion, the fungus penetrates deeper into the shoot and leaf tissues. These tissues soon exhibit the symptoms described. Continued invasion of the tissues by the pathogen may result in death of the buds and leaves and girdling of the young shoots.

During the growing season after infection, the fungus develops the second spore producing structures, called *pycnidia*. The spores produced in pycnidia, called *conidia*, ooze from an opening in the pycnidia and are spashed by rain or sprinklers to adjacent young shoots and leaves, thus initiating additional infections throughout the summer.

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Control

A new planting of disease free plants is the first step in controlling this disease. Such stock is usually available through your local nursery or greenhouse.

Before planting, select a growing site that has good air drainage. Moisture in the form of dew, rain or sprinkler is essential for the fungus spores to germinate and penetrate raspberry leaf and shoot tissues. Therefore, good air drainage will quickly dry infection sites on the plants.

Immediately after planting, remove and destroy the "handles" or year-old canes. Do this before or just as new shoots develop from the crown. "Handles" are the main source of spur blight infection on new shoots.

Clean cultivate in and between the rows during April, May and June. Remove the weeds because they not only hold moisture but also reduce air movement and may interfere with proper spray chemical coverage of the raspberry plants. Weeds also utilize soil nutrients.

In addition to the cultural practices, the homeowner should follow a chemical spray program. Such a program will help prevent the introduction of spur blight and will reduce the level of the disease if it is already in the planting. Apply sprays according to the stage of growth of the plants. **Complete coverage of the foliage and canes is essential.** The following spray program has proved effective:*

A. Spring and early summer sprays.

1. Apply a delayed dormant spray of lime-sulfur at the rate of one pint per gallon of water when the new leaves are exposed about $\frac{1}{2}$ to $\frac{3}{4}$ inch.
2. Spray with Ferbam at the rate of $1\frac{1}{2}$ tablespoons or Captan at 2 tablespoons per gallon of water when the blossoms on the fruiting canes are in bud. The new canes will be about 8 to 10 inches high.

B. Summer and fall sprays.

4. Apply another spray in July-August if sprinkler irrigation is used or if rains occur.
5. Apply a fourth spray immediately after harvest.
6. Remove and destroy the old fruiting canes after harvest.
7. Apply a dormant spray of lime-sulfur at the rate of one pint per gallon of water.

Because the fungus does not live over in the roots, you can renovate a badly infested raspberry patch by cutting off and destroying all the canes before growth is initiated in the spring. After this, follow the suggested control program. New shoots relatively free from spur blight should develop.

ANTHRACNOSE

This fungus disease occurs primarily on black and purple raspberries. Occasionally it appears on red raspberry varieties, but seldom severe enough to warrant the cost of a spray program.

*The toxicity of pesticides listed here is low. Trade names are used only to identify the chemicals as they are known in the marketplace. No endorsement by the University is intended, nor is discrimination implied against products not listed.

Symptoms

The most striking symptoms of this disease are on the canes. The older canes frequently exhibit circular sunken spots or lesions about $\frac{1}{8}$ inch in diameter. At first these infections are purplish, later turning gray. As the canes age, the spots become deeper with raised purplish margins.

The disease can become serious when rains continue through late spring and early summer, or under sprinkler irrigation. Under these conditions the spots on the canes may be so plentiful as to girdle the canes, thus interfering with upward flow of water and nutrients.

Most infections occur on the inside of the canes toward the center of the plant and from 6 to 30 inches up the cane. Infections on current season canes show symptoms near the ground level. The disease often results in an uneven ripening of the berries.

As the infected canes dry out, they crack up and down for an inch or two. In some cases the old canes present a rough appearance, sometimes warted or knotted, because of the swelling of tissue beneath the bark in the regions affected by the fungus. Such canes are less winter hardy. A late infection may occur on the lateral branches, stunting them and preventing proper growth and bud formation for the next season.

Cause

Anthracnose is incited by the fungus *Elsina veneta*. It survives the winter in infected canes. Perpetuation of the disease is dependent upon the survival of fungus threads (*mycelia*) in infected raspberry canes during winter. Conidia produced on specialized fungus mats coincide with the leafing out of black raspberries in the spring. The spores, in the presence of moisture, germinate and penetrate the young canes and branches.

Later, after symptoms of the disease are visible, and with continued irrigation, the specialized fungus mats are formed. Profuse production of conidia occurs which initiate additional new infections.

Control

The preventive measures used to control cane blight also will control anthracnose.

CANE BLIGHT

The fungus causing cane blight can infect all commonly grown varieties of raspberries. The disease often is confused with spur blight and anthracnose. Cane blight infects its hosts **only** through wounds, especially pruning wounds; whereas the spur blight and anthracnose fungi invade young tissues directly. Cane blight usually does not cause as severe damage as spur blight or anthracnose and is considered a minor disease of raspberries in Idaho.

Symptoms

Lesions develop at wound sites particularly on canes that have been tipped or pruned back to force lateral growth. A brown to black infected area develops that may

extend down one side or ring a cane for several inches below a wound. Fruiting canes infected the previous year have light-colored fissured bark covered with small black fruiting bodies of the fungus. These fruiting bodies develop only on dead infected areas of the canes. The infected area often extends over several nodes. This is in contrast to spur blight which usually is limited to individual nodes.

The wood of canes infected with cane blight is brown and breaks easily. Lateral shoots on infected canes grow poorly and often wilt and die in warm weather.

Cause

The fungus *Melanommia coniothyrium* incites cane blight of raspberries. The microscopic, black spore producing bodies observed in the infected dead areas may be either perithecia or pycnidia, or both fruiting structures may occur in the same area. The spores produced in the perithecia are not necessarily important in the maintenance of fungus inoculum because the pycnidia may produce and release conidia for at least four years. Yet both spore stages are capable of initiating infection.

Infection can be established at any time during the growing season if moist conditions occur. Warm wet weather in midsummer followed the next year by a wet spring and a dry fruit-ripening period results in the greatest losses because of the collapse of fruiting canes infected the previous year.

Control

Spraying with fungicides during the growing season is of little value in controlling cane blight. However, the application of lime sulfur as a spring dormant spray is of benefit.

Extreme care in pruning is the best control for cane blight. Prune plants at least three days before an anticipated rain or before sprinkling so that pruning wounds will callus before infection can develop. Old infected canes and infected tips serve as sources of fungus inoculum for several years. Therefore, routinely cut out and destroy these plant parts.

LEAF RUST

This disease has been observed on red raspberry varieties and only in northern Idaho. Usually it is of minor importance, but the fungus may prematurely defoliate certain varieties.

Symptoms

Many small yellowish pustules filled with yellow spores form on the underside of infected leaves. Badly infected leaves drop prematurely, and canes of susceptible varieties, such as Washington or Latham, may be bare by September.

Black winter spores appear during the fall on the undersides of the leaves that previously showed the yellow spore stage. Spores produced on infected plant material initiate new infections in the spring. All succulent parts of the plant are subject to infection. Infected canes often are brittle and may break off when one prunes out the old fruiting canes.

Cause

The incitant of raspberry leaf rust is the fungus *Phragmidium rubi-idaei*. This fungus has five stages in its life cycle, three of which are produced on living raspberry tissues. The other two stages are produced on dead infected raspberry tissue.

The black overwintering spores require several months of winter weather to condition them to germinate in the spring. Upon germination, specialized infective spores are produced, which initiate infection on the plants. After infection, two other stages of the life cycle occur, which eventually results in the formation of the yellow pustules one observes on the undersides of the leaves.

Control

Attempt to remove all possible sources of infection. The most practical control involves undertaking a late fall or early spring cultivation to bury fallen leaves, old cane stubs, and refuse before the new leaves appear.

When new leaves are at the green tip stage, apply lime sulfur at the rate of 10 tablespoons per gallon of water. Make a second application two weeks later with lime sulfur at the rate of 6½ tablespoons per gallon of water, or with Ferbam at the rate of 1¾ tablespoons per gallon of water. If the weather remains humid, apply Ferbam at the above rate just before blossoming.

Remove the old fruiting canes as soon as possible after harvest. Cut the old canes flush with the ground level.

POWDERY MILDEW

This foliar disease is of minor importance in Idaho and attacks only a few varieties of red, black and purple raspberries. Most raspberry varieties are resistant to the fungus. As a group, however, the red raspberries are the least resistant. The disease has been observed along the Payette River and in northern Idaho.

Symptoms

Powdery mildew is an external fungus parasite that coats the foliage, young growing tips and fruits with a whitish gray powdery coating. Shoot tips may be covered with the mealy growth and become long and spindly (rat-tailed), with dwarfed leaves. Severe mildew retards, dwarfs and distorts plant parts. If the fruits of red raspberries are attacked when green, they fail to grow to full size, wither and die.

Cause

Powdery mildew of raspberries is incited by the fungus *Sphaerotheca humuli*. It survives the winter in the dormant buds of the stunted cane tips. The fungus mycelia produce great numbers of spores at temperatures between 65 and 80 degrees Fahrenheit. Infection of the succulent shoots, leaves and berries occurs readily at those temperatures and when the relative humidity is 97 to 99%.

Control

Remove late-formed mildewed suckers in the fall and cut back fruiting canes to a desirable height in the spring.

This will reduce considerably the overwintered spring inoculum. Space the plants to provide good air drainage.

Apply a dormant spray of lime sulfur at the rate of one pint per gallon of water.

If powdery mildew is present just before the blossoming period, apply either sulfur or Benlate when the first blossoms open and at weekly intervals until all fruit is set.

Follow the label instructions for rates of application.

LEAF SPOT

This fungus disease has been found occasionally in various areas of Idaho. The disease often has been called "*Septoria leaf spot*".

Symptoms

Tiny greenish-black spots develop on the upper surfaces of infected leaves. As the leaves mature, the spots enlarge to slightly larger than a pinhead and become whitish or gray in color. The enlarged spots retain a well defined margin. The centers may drop out, producing a

shot-hole effect. Severely infected leaves drop prematurely. Small almost inconspicuous lesions may develop toward the bases of the canes.

Cause

The disease is incited by the fungus *Sphaerulina rubi*. The fungus survives the winter in specialized fruiting structures (pycnidia) in infected canes and leaves. In the early spring spores are formed within the overwintering structures. Spore formation and the discharge of them coincide with the development of the very young leaves and new shoots. The spores that land on such plant structures germinate in the presence of moisture, penetrate the host tissues and initiate infection. After symptoms are expressed, additional pycnidia develop in the infected areas and additional spores are produced which, if wet weather continues, initiate new infections on the new developing leaves and canes.

Control

Control measures suggested for spur blight and anthracnose also will control raspberry leaf spot.