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Diseases of Raspberries in Idaho

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BACTERIAL DISEASES

Crown Gall and Cane Gall

Two diseases of bacterial origin have been found in home plantings of raspberries and other brambles in all areas of Idaho. These diseases, crown gall and cane gall, are incited by 2 species of bacteria, *Agrobacterium tumefaciens* and *Agrobacterium rubi*, respectively. The crown gall bacterium can infect a wide array of annual and perennial broadleafed plants. Woody perennial plants are affected most seriously. Cane gall is more restricted in its host range and is important on the various brambles.

Both of the disease-causing bacterial species may be introduced into previously noninfested soil on infected host plants. After introduction they may survive in the soil several years.

Crown Gall Symptoms

Warty galls are formed at wound sites on the aerial portions of the canes, but more commonly at the base of the canes or on the roots. The galls vary from the size of a pinhead to several inches in diameter. When the below-ground portions of the plant are infected, the plant becomes devitalized and will not respond normally to applications of water and fertilizer. Infected plants produce small seedy berries and are less winter hardy.

Control of Crown Gall

Healthy plants in non-infested soil do not develop crown gall. Therefore, disease-free stock planted in clean soil are the two keys to practical control of the disease. Regardless of the source of the planting stock, examine the plants before planting to check for small galls that might have escaped earlier inspection by nursery personnel.

Select a planting site as suggested in Idaho Extension Bulletin 419, but in any case avoid sites that have previously grown brambles or woody perennials. To avoid other diseases such as root rot or Verticillium wilt, do not plant raspberries in sites that have grown strawberries or potatoes during the previous 5 years.

Should crown gall develop in a few plants, remove and destroy the infected plants. Remove the diseased plant roots by removing as much of the soil in the root zone as possible. Fill the hole with disease-free soil from some other site.

If several plants become infected, destroy the entire planting, obtain disease-free plants and start a new planting in a different site. If space doesn't permit you to start a new planting in a new site, you can fumigate the old site with methyl bromide. Instructions for the use of this pesticide are contained in Idaho Current Information Series No. 274.

Cane Gall Symptoms

Small whitish wart-like growths first appear as long masses on canes of the infected plants. As the galls enlarge, they darken and exhibit the appearance of small rough ridges or elongated overgrowths of granular tissue. The galls frequently cause the canes to split open. Such canes dry out, lose vigor, and produce small berries.

Infection occurs when the bacteria come in contact with wounds on the canes or crown area caused by winter injury, pruning, or cultivation. Cane gall appears only above ground on the canes.

Control of Cane Gall

Many of the details of crown gall control apply to the control of cane gall. Since cane gall is more readily seen than crown gall, infected plants can be rogued out easier. With care, you can cut out and destroy infected canes individually. Between each cut, dip the pruning equipment into a container of household Purex or Clorox. This will help to prevent spread of the disease.

VIRUS DISEASES

Leaf Curl and Mosaic

Virus diseases probably cause more damage to raspberries than to any other fruit crop. Most raspberry plantings in Idaho are infested by viruses in varying degrees.

Once a raspberry plant becomes infected, it never recovers and all parts of the plant carry the virus. Therefore, any suckers obtained from such plants also will be infected. Frequently, plants will be infected with more than one virus. So far as is known, raspberry viruses in Idaho are transmitted from diseased to healthy plants by certain species of aphid insects.

Disorders of raspberries that resemble virus-caused symptoms may also be produced by cool weather and late spring frosts, powdery mildew, iron and zinc deficiency, pesticide injury, genetic disorders such as leaf yellowing and crumbly berries, or feeding by leafhoppers, aphids, and red spider mites.

Leaf Curl Symptoms

This virus affects red, black, and purple raspberries. The yield of red raspberries can be reduced 10 to 70 percent. Black raspberries may degenerate and die within 2 to 3 years after becoming infected.

During the current year of infection, plants exhibit few symptoms — only a mild down-curling of the tip leaves. The following spring, leaflets in the tip region appear rounded, dwarfed, and crinkled. The leaf margins are curled tightly downward and inward. Fruiting laterals are shortened.

When infected shoots first appear, they may be pale yellowish green, but they soon turn dark green, become stiff and brittle, and usually do not branch. Each year the plant loses vigor and new shoots are progressively more dwarfed. The berries are small, seedy, and crumbly.

Mosaic Symptoms

Viruses comprising the raspberry mosaic complex are the most widespread and most consistent in Idaho plantings. Fruit yield may be reduced 50 percent or more.

Symptoms vary with the variety of raspberry, the viruses involved in the mosaic complex, and the season of the year. Mosaic is most readily seen during the cooler parts of the growing season in late spring and again in the fall. During the hot part of the summer the symptoms may almost completely disappear. Mosaic symptoms are sometimes confused with late spring frost damage, pesticide injury, and infestations of spider mites or aphids.

On red raspberry, mosaic viruses cause short, weak canes. The leaves that are produced in cool weather are mottled, puckered, and misshapened. Fruit from a thoroughly infected plant is usually dry, seedy or crumbly, and lacking in flavor.

The condition of the foliage on young suckers furnishes the most constant symptom of mosaic on red raspberries. In late spring, the leaves begin to show large, irregular, green blisters that arch upward. The tissue around the blisters is yellowish. Leaves produced in the heat of summer exhibit yellow flecking in the normally green tissue. In late summer, the leaves near the tip of the sucker show a fine, yellowish, speckled mottling. Leaves on the fruiting canes are smaller than normal and, on many varieties, show large blisters and yellowish specks.

On black and purple raspberries, the tips of newly infected canes may bend downward, turn black and die. The leaves become mottled and develop a pattern of elevated dark green areas with surrounding light green depressions. Infected plants become dwarfed. Shoots tend to be brittle near the tips and to snap off. Foliage produced during hot weather may be almost symptomless. Infected plants begin to leaf out in the spring a few days after healthy plants have begun to leaf out. The fruits are dry and seedy.

Control of Raspberry Viruses

Obtain virus-free nursery stock. The U.S. Department of Agriculture has developed virus indexed stocks of many desirable raspberry varieties. These are propagated under rigidly controlled conditions by growers in well-designed programs certified by state authorities. Virus-indexed plants sell at a premium, but are well worth the extra expense.

Idaho does not have a raspberry certification program, but local nurserymen have lists of growers in other states that have such a program.

As soon as virus is detected, remove the infected plants regardless of the time of year. Any delay in removal may result in the infection of adjacent plants in the planting.

Other College of Agriculture publications dealing with raspberries include:

Extension Bulletin No. 419, Growing Raspberries in Idaho

Current Information Series No. 317, Fungus Diseases Affecting the Leaves and Canes of Raspberries in Idaho

Current Information Series No. 341, Crumbly Fruit in Raspberries

SOILBORNE FUNGUS DISEASES

Root Rot and Verticillium Wilt

Two of the most common soilborne disorders associated with unthriftiness of raspberries in Idaho are root rot and Verticillium wilt. The 2 diseases occur in varying degrees in most raspberry plantings in the state.

Root Rot Symptoms

This is a complex, poorly understood disease. Although any one of many distinctly different fungi can incite the disease, 2 or more fungi are usually associated with the condition. Different fungal associations may occur in different areas of the state. Regardless of the complexity of the condition, symptoms are nearly identical.

Root rot may affect individual plants or all the plants in a planting. Infected plants exhibit a general unthriftiness. They appear to be suffering from a shortage of water and nutrients, yet they will not respond to additional applications of water or fertilizer. In fact, additional water may result in a more rapid decline of some plants.

The leaves of infected plants are smaller than normal, have short petioles, and may be off color. Following 10 days to 2 weeks of hot weather, the older leaves may wither or become bronzed and scorched. Fruiting canes are usually shortened and the berries, if formed, remain small. They may be seedy or may wither and dry up before ripening. New shoots formed during the current season appear to be healthy, providing some hope to the grower. But the following year these canes express the disease symptoms.

Because other diseases and low nutrition can cause a general decline of raspberries, you can identify root rot only if you carefully dig affected plants, wash the soil away, and observe the condition of the feeder plants. On healthy plants, the older roots should be light brown externally and white to cream colored at the core. Feeder rootlets should be glistening white and abundant.

In diseased plants, external portions of the older roots will exhibit lesions, and instead of being a light brown will be dark brown to black. The internal core may be streaked or generally discolored. Streaking may extend into the crown area. The rootlets will be sparse, or totally absent. If rootlets are present, they show dead spots or lesions, or they may be partially or completely girdled.

One wonders sometimes how the plant has survived as long as it has.

Root Rot Cause

At least 6 and possibly more distinct genera and species of fungi are associated with raspberry root rot. A few of the fungi attack and kill only the feeder rootlets. Others invade the feeder rootlets and the older roots. The disease occurs in varying degrees in all soil types — from nearly pure sand to heavy clay. All the fungi can survive in the soil several years in the absence of a host. Some of the fungi attack and cause root rot on many different plant species. Others affect only a few plant species.

Some of these pathogens are considered to be low-grade parasites — that is, capable of invading only host tissue which has been weakened by some other factor. On the other hand, some of the fungi associated with raspberry root rots are virulent, the same as those causing black root of strawberries and root rot and stem canker of other plants.

Control

Present control measures are based largely on preventing or delaying infection rather than curing diseased plants. To alleviate root rot:

1. Select only disease-free plants. Select plants that have a profuse, glistening white rootlet system. Discard those that have a sparse root system and those whose root system is not white, even if roots are abundant.
2. Plant in soil that has not grown strawberries, raspberries, tomatoes, potatoes, peppers, or eggplant for 4 years or more.
3. Allow the plants to bear for 2 years. During the second year of production start a new patch with new, disease-free plants. Then destroy the old patch after the fruit has been picked. This way you can rotate your raspberry patch with the rest of the garden over a period of several years.
4. If possible, mix grass clippings or well-rooted compost into the soil a year before a new planting is established. This not only adds organic matter to the soil but stimulates biological activity that will help keep down the population of root rot-causing organisms.
5. Sometimes available space is limiting and you must start the new patch in a site that has grown plants susceptible to the fungi. Soil fumigation will help reduce or kill the disease-causing fungi. Details on soil fumigation are included in Idaho Current Information Series No. 274, "How to Use Methyl Bromide."

For commercial plantings a preplant soil fumigation with Telone at the rate of 50 gallons per acre has shown promising results and is suggested for trial.

Verticillium Wilt Symptoms

This disease, also referred to as bluestem or blue strip wilt, is particularly devastating to black raspberries, but severe, damage can result with infected red raspberry varieties.

On black and purple raspberries new infections of Verticillium wilt can cause leaves of new canes to turn pale in midsummer. The plants may appear to recover during cool fall weather, but the following spring, the leaves on the fruiting canes may turn yellow, then wilt and die, beginning at the bottom and moving upward. Infected canes are stunted and may turn entirely blue or may develop bluish stripes or ribbons on one side before they wilt and die.

Internally, the water-conducting tissues in the roots, crown, and canes will exhibit a brown to reddish discoloration in contrast to the normal white to cream color. Infected plants usually die in 1 to 3 years.

The symptoms on red raspberries are generally less severe than on black raspberries, but leaf symptoms are similar. Often leaflets fall before petioles drop. A tuft of leaves may remain at the tip on infected canes. Cane discoloration is not as prominent as it is on black raspberries. Since the fungus may infect only a part of the plant, one or more canes of the plant may die while the rest appears to be healthy.

Red raspberries infected with Verticillium wilt, but in the absence of root rots, may survive several years, but the amount of suckering is reduced. Yield and quality of the fruit is also reduced, because the plants are under continued stress throughout the growing season.

Cause

Verticillium dahliae, the causal agent, is a soil-inhabiting fungus. It has a wide host range of many plant families. To infect plants, the fungus enters root hairs or small rootlets. After penetration the fungus grows between the cells, progressing to the water conducting tissues, first in the roots and eventually into the same tissues of the crown and canes.

With death of the plant or plant parts, the fungus is returned to the soil where it maintains itself in competition with other soil micro-organisms.

Control

The control measures suggested for root rot also will control Verticillium wilt.

The toxicity of pesticides listed here is relatively high. 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.

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