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H. W. Fenwick
Extension Plant Pathologist

STRAWBERRY DISEASES AND THEIR CONTROL IN IDAHO

Many disease-causing organisms attack the strawberry plant. In Idaho two root diseases caused by soil-inhabiting fungi are particularly devastating and often result in serious plant and fruit loss for the homeowner. Fungus foliar diseases in some locales cause stunted plants, reduced winter hardiness and less fruit. Fruit rots and diseases caused by viruses and nematodes generally are of little importance.

Root Diseases

The root system of a healthy strawberry plant is composed of structural or supporting roots and feeder roots. The structural roots are hard, woody and generally dark-colored. They penetrate deep into the soil where possible, have a rather thick, distinct bark and are capable of long life. They support the feeder rootlets.

Feeder rootlets absorb water and nutrients needed for plant growth from the soil. Large yields and good fruit size are possible only when strawberry plants are supported by extensively developed feeder rootlets. Healthy strawberry rootlets are glistening white, and are clothed with root hairs over much of their surfaces.

Two major diseases, Verticillium Wilt and Black Root Rot, attack the roots of strawberries. Both are widespread and destructive in Idaho. Above-ground symptoms of both diseases are not evident until after extensive below ground damage has occurred.

Verticillium Wilt

This disease often is referred to as brown blight or brown root rot. It is caused by a fungus that is an inhabitant of most soils and has a very wide range of different kinds of plant hosts.

Symptoms — Beginning about mid-July or 2 to 3 weeks after the onset of hot weather, the outer leaves suddenly wilt and dry up. The younger, inner leaves appear paler than normal and begin to curl upward. Growth of the new leaves is retarded. The stems of the leaves may show brownish-black streaks along the upper (grooved) side. As the season progresses, more leaves collapse and the stunting becomes more pronounced until the entire plant dies. The disease usually spreads to the runner plants.

During the fruiting year the outer leaves of infected plants begin to yellow or redden just after bloom. As the fruit begin to ripen the plants wilt and die.

Cause — Verticillium Wilt is caused by the soil-inhabiting fungus *Verticillium albo-atrum*. It can live several years in the soil even in the absence of host plants. The fungus can be introduced into "clean" soil on infected planting stock or on equipment contaminated with infested soil. It can be disseminated in the soil by cultivation or soil erosion by wind and water.

Infection is by direct penetration of the roots growing in infested soil. Wounding of roots is not necessary. The fungus builds up to high populations on strawberries and other susceptible plants such as raspberries, tomatoes, potatoes, peppers and eggplant. Common weeds such as nightshade and lambsquarter also are hosts.

Black Root Rot

Symptoms — One of the first effects of this disease is to kill feeder rootlets. This reduces plant vigor. Later the outer tissues of the perennial roots darken. The central core of the perennial roots remains white and sound for awhile but also deteriorates as the disease progresses. Severely infected plants possess a very sparse root system with few if any white glistening feeder rootlets.

Above ground, the plants are stunted. The leaves are small, often with marginal burning. The fruits are small and leathery with the seeds often very prominent. The plants may survive the summer but most die. Those that survive produce fewer runner plants.

Cause — Black root rot is caused by several soil-inhabiting fungi that may be present in most soils, particularly the heavier soils. Some of these fungi have a limited host range. Others such as *Rhizoctonia solani* and *Pythium ultimum* attack a wide array of plants. The fungi penetrate the roots directly or through wounds. One or more of the following factors increase the chances of black root rot: plant parasitic nematodes, winter injury, heaving of the soil from freezing and thawing, chemical injury from herbicides or fertilizer burn, drought, excessively wet soil, excessively alkaline soil or generally low nutrition.

Controlling Verticillium Wilt And Black Root Rot

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

- (1) Select only disease-free plants. The plants you select should have a profuse glistening white rootlet system. Discard those that have a sparse root system, and those whose root system is not white.
- (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 strawberry patch with the rest of the garden over a period of several years.
- (4) If possible, mix grass clippings or well-rotted 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 disease-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."

Foliar Diseases

Two diseases incited by fungi attack the leaves of strawberries. Both fungi survive the winter on old, infected leaf tissues. These diseases are Leaf Spot and Powdery Mildew.

Leaf Spot

Symptoms — Foliage symptoms at first are a dark red or purplish color, gradually becoming grayish or almost white with age. Fully developed spots are about one-eighth inch in diameter with a whitish center and reddish margin and are scattered over the leaf surfaces causing a reduction of leaf function. Infections occur during moist weather and are most severe in the spring and fall. Midsummer infections are seen when the plants are supplied water by sprinklers.

Control — Remove and destroy the foliage after harvest. This will reduce the amount of fungus inoculum in the planting. Clip the foliage with a lawn mower raised to its maximum height. Leave the grass catcher attached to collect the infected leaves. The leaves also can be cut off with a scythe, then raked and removed. Removing infected leaves usually will control the disease in areas where incidence of the disease has not been severe.

PESTICIDE RESIDUES: These recommendations are based on the best information currently available for each chemical listed. If followed carefully, residues should not exceed the tolerance established for any particular chemical. To avoid excessive residues, follow recommendations carefully with respect to dosage levels, number of applications and minimum interval between application and harvest.

Remember: Read the label directions thoroughly before preparing and applying pesticides. Many of the commercially prepared mixtures contain insecticides as well as fungicides.

THE GROWER IS RESPONSIBLE FOR RESIDUES ON HIS CROPS AS WELL AS FOR PROBLEMS CAUSED BY DRIFT FROM HIS PROPERTY TO OTHER PROPERTIES OR CROPS.

The toxicity of pesticides listed here is relatively 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.

When the disease occurs yearly or the incidence in a specific year has been severe, remove leaves and use fungicidal sprays to provide control. Apply the first spray when growth starts in the spring and maintain a protective cover spray (about every 10 to 14 days) until warm dry weather or until the berries are one-third grown. Chemical materials that can be used are Bordeaux 6-6-100* or Benlate at ½ to 1 tablespoon per gallon of water.

Powdery Mildew

Symptoms — Powdery mildew may be recognized by the upward curling of infected leaves exposing undersides which are coated with a grayish-white mildew fungus growth. Diseased leaves later become purplish to red in color. The effect of powdery mildew usually is not great, but leaf function can be reduced.

Control — Plant resistant varieties where they are adapted. The varieties Marshall and Hood are very tolerant and Northwest and Molalla are moderately susceptible. Sulfur used as a dust, spray or flowable powder applied when the mildew is first evident will provide excellent control. So will Benlate applied at ½ to 1 tablespoon per gallon of water. More than one application 10 to 14 days apart may be necessary in some areas.

Follow manufacturer's recommendations. Destruction of old* leaves after harvest may help reduce the amount of fungus inoculum.

* Bordeaux 6-6-100 means a Bordeaux mixture of 6 lb. of copper sulfate plus 6 lb. of lime in 100 gal. of spray. In any Bordeaux formula, the ingredients are always given in the same order with copper sulfate first, then lime and water.