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AG FACTS

Raspberry Diseases in Michigan

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Virus Diseases

Virus diseases are the main cause for losses in raspberry production. They are largely responsible for the decline in Michigan raspberry production from about 14,000 acres in 1950 to less than 1,000 acres in 1980. Certain steps can be taken to minimize virus infection and thereby maintain healthy plants and good production. Following are the most common raspberry diseases. For recommended pesticides, rates and times of application, see Extension Bulletin E-154, Fruit Spraying Calendar.

Raspberry Mosaic Virus

This is the most widespread and damaging raspberry virus. All commonly grown cultivars can be infected by the mosaic virus, except for Canby, which is resistant. Mosaic symptoms consist of light green to dark green or yellow to green mottling of the leaves on infected canes (Fig. 1A); blistering of leaves as well as a mosaic pattern are also evident (Fig. 1B). The plants show a progressive stunting of growth and poor yield. Fruits on infected bushes are small and crumbly. The common raspberry aphid (a rather large, greenish aphid found on shoot tips and on the undersides of the leaves) spreads the virus from diseased cultivated and wild raspberry plants.

Figure 1a. Mottling of leaves is a typical symptom of raspberry mosaic virus infection.

Figure 1b. Blistering of leaves as well as mosaic pattern can occur with raspberry mosaic virus.

Raspberry Leaf Curl Virus

Leaves on infected canes are rounded, curl downward and are usually of a greasy, dark green color (Fig. 2). Growth is stunted, and fruit production is reduced. A small, yellow-green aphid found on the undersides of leaves spreads this disease.

Tobacco Streak Virus

Tobacco streak virus symptoms are somewhat deformed leaves blotched with yellow areas (Fig. 3) and poor fruit production. Since the virus is pollen-borne, healthy plants can become infected by pollen from a diseased plant.

Tomato Ringspot Virus

This virus is widespread throughout the Michigan fruit growing area. It causes disease in stone fruits (peaches, plums, cherries, etc.), pome fruits (apples, pears, etc.), blueberries and grapes. Symptoms in raspberries are not very strong. A few leaves on infected bushes may show some pale ringspots in the spring, but these later disappear. The main effect is a general stunting of the bush, a general yellowing of leaves (Fig. 4) and production of small, crumbly fruit. Virtually all raspberry varieties are susceptible. Tomato ringspot virus

Figure 2. Leaves are rounded, curl downward and dark green in color with raspberry leaf curl virus infection.

Figure 3. Deformed leaves blotched with yellow are symptoms of tobacco streak virus infection.

Figure 4. Tomato ringspot virus infection causes plant stunting and general yellowing of leaves.

has a very wide range of hosts, including many weeds such as dandelion, curly dock, plantain and chickweed. The virus is spread by the dagger nematode *Xiphinema americanum* from the roots of diseased raspberry bushes or weeds to the roots of healthy bushes.

Control: Purchase and plant only **Certified Virus-Tested** raspberry stock. Such stocks have been tested for the presence of known virus and other systemic diseases. If planting stocks are not certified, they probably will contain one or more of the viruses described in this publication. Plant stock in soil free of virus-vector nematodes (*Xiphinema americanum*—dagger nematode). If soil is found to contain this or other plant pathogenic nematodes, use a preplant soil fumigant. Locate new plantings 400 yards from other cultivated raspberries which may harbor the virus. Eliminate any wild raspberries (*Rubus spp.*) that are within this distance, using an appropriate herbicide. Use insecticides, such as Diazinon or Malathion, on a regular basis beginning in mid-May and ending after the first killing frost in the autumn.This helps prevent build-up of virus-carrying aphids. Pull out and burn any plants that show virus disease symptoms.

Fungal Diseases

Anthracnose

Black and purple raspberry varieties are most seriously affected by anthracnose (*Elsinoe veneta*), but the disease can be economically significant on red varieties also. Symptoms appear on canes, leaves, and sometimes on the fruit. Infected canes show tiny purple

Figure 5a. Gray spots with purple borders will occur on canes infected with Antracnose.

Figure 5b. Shot-hole appearance of leaves infected with anthracnose.

spots which progress to light grey round spots about 1/8 inch in diameter. The spots enlarge to about 1/4 inch, have ash-grey centers and may have purple borders (Fig. 5A). As the canes age, the spots appear sunken and the borders raised. Leaves will develop similar small round spots or lesions about 1/16 inch in diameter (Fig. 5B). Diseased tissue frequently drops out leaving a "shot-hole" appearance. If the disease is not controlled, canes become cracked and the drupelets of the berries become infected, resulting in worthless fruit. The fungus survives the winter in infected canes and produces spores (both conidia and ascospores) in the spring at the time of leafing out. The disease can become serious with abundant rain in late spring and early summer, or under sprinkler irrigation.

Control: Use disease-free plants. After harvest, cut out and burn old fruiting canes and new canes that show disease symptoms.

Spur Blight

Spur blight (*Didymella applanata*), is a serious disease of red raspberry varieties. Infected canes release ascospores and conidia in May and June during rainy periods. Conidia release contin-

Figures 6a. Brownish purple cane lesions of spur blight start at a spur but can extend up or down the cane.

ues throughout the growing season during wet weather. Small, brown or purple spots appear around the nodes on the lower portions of the canes. These areas turn brown, causing the leaf and flower buds to shrivel and die. Leaf lesions appear as brown wedge-shaped areas. Diseased canes dry out and crack as they mature; the lesions turn brownish purple and enlarge to cover much of the cane (Fig. 6A).

Cane Blight

The symptoms of cane blight (*Coniothyrium fuckelii*) can easily be confused with those of spur blight. Both diseases cause considerable damage to Michigan raspberries. The fungus can live for several years in cane debris left in the field. Spores release (both ascospores and conidia), and subse-

Figure 6b. The long brown or black cane lesions of cane blight can be confused easily with those of spur blight.

quent infection begins in the spring. Conidial infection continues throughout the growing season during rainy weather. Wounds from pruning, insect feeding or cane rubbing are the initial sites of infection. Brown or black infected areas extend down one side of the cane for several inches (Fig. 6B). Fruiting canes infected the previous season have light colored, cracked bark. Lateral shoots on infected canes grow poorly and may wilt and die during hot weather.

Control: Never prune during wet weather. To prevent infection, canes should remain dry for at least 3 days after pruning so wounds will callus. Prune out and burn infected canes in the spring.

Figure 7. Small, yellow infected leaves with orange spore pustules are typical syptoms of orange rust.

Orange Rust

Orange rust (*Kunkelia nitens*) attacks black and purple raspberries, but not red varieties. Leaf symptoms develop toward the end of June. Infected leaves are small and yellowish with orange pustules of waxy rust spores on the underside of the leaves (Fig. 7). The spores are shed and cause new infections over a 2- to 3-week period. Leaf symptoms disappear from the field by mid- to late summer. The fungus invades all parts of the plant (including the roots).

Figure 8. Orange rust pustules on back of late leaf rust infected leaf.

Infected plants never recover. Newly infected canes are weak, spindly and lack spines (thorns). Infected canes will not blossom the following year.

Control: Plant rust-free raspberries. Remove and burn any plants that show symptoms. Kill nearby wild raspberry plants. Fungicidal control is not effective.

Late Leaf Rust

Late leaf rust (*Pucciniastrum americanum*) causes disease in red raspberries, usually later in the season. Older (basal) leaves are covered with fine, light-yellow, powdery masses of spores in midsummer (Fig. 8). The spore masses can appear on leaf petioles, shoots, calyces (fruit caps) and even on the fruits. The popularity of the Heritage cultivar of red raspberry has made this disease more prevalent. Rust disease builds up on the leaves of this fall bearing variety because of the long growing season.

Control: No official control recommendations are available at the present time.

Verticillium Wilt

Verticillium wilt (*Verticillium albo-atrum*) of raspberries is caused by a soil borne fungus. The fungus penetrates

Figure 9. Leaf yellowing and blue stems are the symptoms of Verticillium wilt.

Figure 10. Injection of soil fumigant using a shank-type applicator.