

Management of Important Blackberry Diseases in Arkansas

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Introduction

Blackberries are growing in popularity nationwide thanks to their improved taste and the increasing awareness of their health benefits.

Anthracnose

Anthracnose is caused by the fungus *Elsinoe veneta*. Under favorable conditions, this disease can cause severe cane spotting, leaf drop, stunting, death of canes, poor quality fruit and low yields.

Symptoms. Anthracnose first appears on young canes as small, slightly sunken purple spots (lesions). As lesions enlarge, they become oval in shape, turn gray in the center and develop dark raised borders (see photos). The disease spreads following rainy periods as long as succulent, susceptible cane tissue is present. Lesions continue to deepen into the woody portion of the cane, sometimes causing it to crack. Many individual lesions (about 1/8 inch in diameter) may grow together to form large, irregularly shaped lesions – often on primocanes – during late summer or early fall. This results in a graying of the bark, especially on the side most exposed to the sun. These surface lesions do not directly harm canes but may provide spores for more serious infections of susceptible blackberries planted in close proximity. Disease risk is greatest between bud break and preharvest, since damage primarily occurs on young, actively growing parts of the plant.

Disease Cycle. The fungus survives the winter in lesions on diseased canes, both in the orchard and on nearby wild blackberries. The following spring and summer during wet, rainy periods, spores are splashed to first-year primocanes where they germinate and infect young growing tissue. Extended periods of wet weather or heavy use of overhead irrigation strongly favors this disease.



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Control. It is helpful to apply a delayed dormant spray of lime, sulfur, copper hydroxide or certain fungicides in February before growth starts and while temperatures are still cold. Since wetness of the canes favors anthracnose, steps to reduce leaf wetness should help. Avoid excessive nitrogen fertilizer, which results in “lush” growth of canes and leaves, poor air circulation and slow drying of foliage. Thinning plants to improve air circulation and light penetration should help as well. Weeds block air movement, so good weed control is essential. Use overhead irrigation only when needed, and irrigate early in the day so foliage can dry out in the afternoon. Since the fungus survives on infected canes, remove and destroy all old canes after the final harvest and remove any new canes that have lesions. Destroy all wild blackberries, dewberries and raspberries in the immediate area because they may also harbor the disease.

While cultural practices may control diseases in gardens, fungicide applications for practical disease control and yield protection should be considered for large commercial orchards. Recommended foliar fungicides for use during the season may change from year to year, so consult the local county extension office for the latest information. Keep in mind that products are registered by state, so not all products recommended in some states will be legal to use in Arkansas. The latest fungicide information and guidelines can be found on the University of Arkansas Division of Agriculture Extension web site <http://www.uaex.edu/Other_Areas/publications/HTML/MP-154.asp>.

Orange Rust

Orange rust, the most common and serious rust disease attacking brambles, is caused by the fungus *Gymnoconia peckiana* (*G. interstitialis*). Orange rust infects most wild blackberries and their domesticated cultivars, including the thornless types, all cultivars of black raspberries and most purple raspberries and dewberries. Orange rust is a systemic rust, meaning that it survives inside the entire plant from year to year. It rarely kills plants but causes them to be stunted and weakened so they produce little or no fruit.

Symptoms. Orange rust is easily identified shortly after new growth appears in the spring. Newly forming shoots are weak, spindly, lack spines and are more susceptible to powdery mildew. Leaves are stunted, misshapened and pale green to yellowish. Several weeks later, lower surfaces are covered with blister-like pustules that are initially waxy but turn powdery and bright orange (see photo). These “rusted” leaves wither and drop by early summer.

Young, apparently healthy canes with normal leaves can be found toward the end of June. Unfortunately, diseased plants are systemically infected, and

the fungus is present in the roots, canes and leaves. “Healthy looking” canes will not blossom the following spring. Each succeeding spring, the underside of the leaves will develop the characteristic orange pustules.

Diseased shoots of rust-infected plants are normally too weak to form rooted tips, which limits cane growth and spread of plants. Instead of one shoot arising from the bud, several stunted canes give infected plants a bunched, “witches’-broom” appearance. A rust-infected plant remains diseased throughout its life.



Disease Cycle. In mid-spring, masses of bright orange spores (aeciospores) are dispersed by wind. These spores contact mature susceptible leaves and produce a germ tube with a swelling (appressorium) that attaches to the host. An infection peg develops from the appressorium, penetrates the cuticle or a stomate and invades epidermal cells. The fungus sends out branching filaments (hyphae) which produce food-absorbing organs (haustoria) within soft-walled parenchyma cells. The rust fungus gradually spreads throughout the canes and runners until the entire plant is infected. In late summer and early fall, pustules turn black or dark brown because of the formation of another type of spore (teliospores). These teliospores either infect directly or produce sporidia (or basidiospores) capable of infecting the buds on the cane tips and the buds or new shoots on crowns of healthy plants. The rust fungus overwinters in the infected host tissues. The orange aeciospores form from new pustules the following spring as the canes start to grow. With the formation of the aeciospores, the life cycle is complete. The possibility of overwintering teliospores producing basidiospores in the spring has not been confirmed.

Control. Begin with disease-free planting stock. If rust is observed, remove infected plants, including roots, from the planting and destroy nearby wild blackberries. When the disease first appears in early spring, dig up and burn infected plants before the pustules break open and discharge spores.

Prune and burn fruiting canes immediately after harvest. Improve air circulation by thinning healthy canes in the rows and keeping the planting free of weeds.

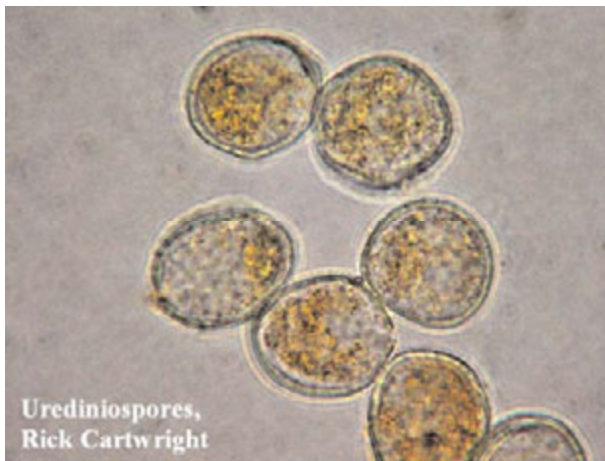
Timely fungicide sprays for control of anthracnose and other foliar diseases do not eliminate rust but will reduce the number of new infections. To minimize spread of the disease, foliar fungicides can be applied in the spring when the bright orange aeciospores are being produced and again in the fall as temperatures start to drop and teliospores become a threat. In a properly managed planting, the disease is usually not serious.

Cane and Leaf Rust

Cane and leaf rust can cause defoliation and some fruit reduction in severe cases, but this disease is not systemic like orange rust. In Arkansas cane and leaf rust is usually only a minor problem.

Symptoms. Floricanes generally exhibit the first symptoms in the spring. Large yellow uredia (see first photo) split the bark on infected canes (see second photo), followed by small yellow uredia on the underside of leaves.

Control. Infected canes should be removed, and protective fungicides should be applied.



Blackberry Rosette

Blackberry rosette (double blossom) is caused by the fungus *Cercospora rubi*.

Symptoms. This disease causes flowers with distorted petals and enlarged sepals, giving the appearance of a double flower, hence the name double blossom (see photo). Unopened flowers are usually elongated and larger, coarser and redder than normal. In addition, shoots may appear abnormal with leafy proliferations (rosette) or witches'-broom. Berries do not develop from infected branches, and other parts of the cane may produce only small, poor quality fruit. Thus, this loss of yield is of concern to growers.



Disease Cycle. When the disease is established, the buds of new canes become infected from fungal spores produced on infected flowers of old canes. These infected canes then develop symptoms the following year. Blackberries can become infected from spores produced on wild blackberries nearby. Blackberry nursery stock can harbor the causal fungus in rooted plants but not in root pieces, which are commonly sold for blackberry propagation.

Control. If possible, select a site isolated from wild blackberries or other brambles. Choose disease-resistant cultivars – this is the most effective control option. Use disease-free nursery stock (roots only). If the disease appears and is not already severe, infected rosettes and blossom clusters should be removed and destroyed before they produce spores. Old canes should be removed and destroyed immediately after harvest. Remove and destroy wild blackberries and other brambles near the planting. If the disease is serious, more drastic action may be needed. Fungicides may be effective in limiting damage, but read and follow label directions carefully. Some growers control this disease by harvesting blackberries in alternate years and destroying the aboveground parts of both the new and old canes in spring every other year. Splitting the planting into two fields allows harvest every year with biennial cropping on each half.

Crown Gall

Crown gall is caused by the bacterium *Agrobacterium tumefaciens* that lives in the soil and infects plants through wounds. Common methods of entry are through wounds made by cultivation, pruning or insect feeding or wind and hail. Once the bacterium enters the plant, it inserts a portion of its DNA (called T-DNA) from the tumor-inducing portion of the bacteria's chromosome into the chromosome of a healthy plant cell. The expression of the T-DNA causes overproduction of plant hormones that lead to undifferentiated cell growth in that region of the plant, thus forming a gall.

Symptoms. Swellings or galls may form above ground on stems or branches or below ground on roots. The galls are usually rounded with a rough surface and a spongy texture and may darken and crack with age (photo). The galls can be confused with galls made by insect or mites and also by physiological responses to wounding or grafting. However, the interior of the gall caused by an insect will have chambers or cavities where the insect developed. The interior of a gall due to crown gall will have a mass of disorganized vascular tissue. It is often necessary to isolate the bacteria through diagnostic methods in order to make a positive identification. The effect that crown gall may have on a plant ranges from little to no impact on the growth and production to declining plant vigor or even death. The disease has a greater impact on young plants and is of great concern to the nursery industry.



Control. The most effective method to manage crown gall is through prevention and sanitation. Plant disease-free, healthy stock from reputable

nurseries. Do not plant in areas where crown gall has been seen during the previous three years. Destroy infected plants immediately, and do not plant back into the same spot. Use care during propagation to avoid transmitting bacteria to healthy plants. Sterilize pruning tools frequently using a disinfectant such as 70 percent alcohol or 10 percent household bleach. Avoid mechanical wounding to young plants by cultivation, weed eating, etc.

Galltrol[®], the biological control agent, has been very successful in preventing crown gall in blackberries. Galltrol[®] is a nonpathogenic strain of *Agrobacterium* that is antagonistic to the crown gall bacterium. It is very effective when used as a preventative, but it will not cure infections after they have occurred. Dip the roots of new planting stock in Galltrol[®] prior to planting and follow label directions closely.

Viruses

There are several virus diseases of blackberries in the U.S. Recently, blackberry yellow vein virus was found in blackberry plantings in the southeastern United States, including Arkansas. Symptoms include vein clearing, yellow mottling and plant decline with considerable variation in symptoms with cultivars. Other viruses may affect blackberries in the state, and plants suspected of having viral infection can be sent to the University of Arkansas Division of Agriculture, Cooperative Extension Service Plant Health Clinic for specific diagnosis. Infected plants should be removed and destroyed to minimize the spread of viruses, and virus-free planting stock should always be sought and purchased. Varieties resistant to certain viruses are available and should be considered when purchasing planting stock.

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