

DISEASES OF SMALL FRUITS

Steve Bost, Professor
Entomology and Plant Pathology

Refer to the manufacturer's label and to the spray guides in this publication for information on chemical rates, timing of sprays, resistance management strategies, preharvest intervals, and other restrictions.

Blackberry Diseases

Disease, Pathogen, Symptoms	Control
<p>Anthracnose (<i>Elsinoe veneta</i>) This disease can be severe on thorned blackberries grown in Tennessee. Leaf spots are roughly circular with a light gray center and a reddish-purple margin. On the berry, individual drupelets become purplish brown and sunken after infection. They eventually become dry and scabby. The most damaging phase of anthracnose in Tennessee is the berry phase.</p>	<p><u>Chemical*</u>: Apply Abound, Cabrio, Pristine, or captan before bloom and repeat at 7- to 14-day intervals through harvest. Make no more than two consecutive applications of Abound, Cabrio, or Pristine before rotating to a non-related fungicide such as captan or copper.</p> <p><u>Cultural</u>: Destroy nearby wild brambles. Plant in well-drained site and allow good air circulation by spacing plants and controlling weeds. Remove and destroy fruiting canes immediately after harvest.</p>
<p>Cane Blight (<i>Leptosphaeria coniothyrium</i>) Cane blight appears only on fruiting canes; infection occurs on primocanes near the end of the growing season. It seems to be most severe when drought stress occurs after widespread infections take place. Cankers form on the cane, often at the nodes, and extend down or encircle it, causing lateral shoots to wilt and die.</p>	<p><u>Chemical</u>: No fungicides have been identified for this purpose, but late-season applications of basic copper sulfate may be helpful. See label for directions.</p> <p><u>Cultural</u>: See anthracnose.</p>
<p>Crown Gall (<i>Agrobacterium tumefaciens</i>) Wartlike growths (galls) appear on the roots or crowns of infected plants. Gall may range in size from that of a pinhead to several inches in diameter. Plants are weakened and yield dry, poorly developed berries. Galls are caused by bacteria present either in the soil or on planting stock. The bacteria enter the plant only through wounds or growth cracks.</p>	<p><u>Chemical</u>: None is effective after infection takes place.</p> <p><u>Cultural</u>: Obtain clean planting stock from a reputable nursery and inspect the roots and crowns for galls. Do not plant in fields with a history of crown gall. Avoid fields previously planted with brambles, grapes, tree fruits or other highly susceptible hosts. The practice of mowing black-berry plants after harvest can cause crown gall problems because of damage to the roots and crowns.</p>
<p>Orange Rust (<i>Kunkelia nitens</i>) Orange rust can be a destructive disease trailing blackberries and purple and black raspberries. Most of the erect blackberry varieties grown in Tennessee are resistant. This disease is caused by a fungus that grows systemically through the plant. The new leaves on infected plants are weak, spindly, and yellowish. Later, the undersides of the leaves show visible orange, blisterlike pustules, which release spores. Canes appear to recover in late summer, but are still diseased and will not bear fruit the following year.</p>	<p><u>Chemical</u>: Apply Abound, Cabrio, Pristine, or Rally beginning in early spring and continue at 10- to 14-day intervals until early summer. Homeowners may use sulfur. These fungicides will not help systemically-infected plants.</p> <p><u>Cultural</u>: Careful inspection in spring and immediate removal of infected plants is the most important practice for controlling orange rust. Dig up infected plants, roots and all, and burn them. Once the spores are produced, they can cause new infections that may not appear until the following spring. Remove and destroy all nearby wild brambles. Plant resistant varieties.</p>

Disease, Pathogen, Symptoms	Control
<p>Rosette (<i>Cercospora rubi</i>) Rosette, or double blossom, can be the most destructive disease of blackberries if allowed to increase after its initial appearance in a planting. "Witches' brooms," broomlike clusters of foliage, arise from buds infected the previous year. Blossoms borne on the bunchy growth fail to bear fruit. Infected blossoms have elongated sepals and wrinkled petals. These blossoms are the sole source of inoculum, which infects new canes. Heavily infected plants are weakened and may die.</p>	<p><u>Chemical*</u>: Alternate Pristine with Switch every 10 to 14 days from early bloom through harvest. If rosette blooms are still present after harvest, fixed copper or Bordeaux mixture can be used, but can cause plant damage in hot weather.</p> <p><u>Cultural</u>: Remove rosettes (infected blossom clusters) before they open. Use only roots, not plants for planting stock. Remove and destroy nearby wild brambles. Plant resistant varieties.</p>
<p>Sterility The cause of blackberry sterility is not fully understood, but may be a virus. Affected plants grow vigorously, but they either fail to set fruit or produce few-seeded berries.</p>	<p><u>Chemical</u>: None.</p> <p><u>Cultural</u>: Remove and destroy plants that fail to set fruit. Plant only certified, disease-free planting stock. Destroy nearby wild brambles.</p>

Blueberry Diseases

<p>Anthracnose (<i>Colletotrichum gloeosporioides</i>) Also called "ripe rot." Infected berries remain symptomless until maturity, when the infected area becomes slightly sunken. Masses of salmon-colored spores are exuded to the surface.</p>	<p><u>Chemical</u>: The spray schedule used for mummy berry control will help in controlling anthracnose. Include Abound, Cabrio, Pristine, or Switch where anthracnose problems are expected. Captan can also be used.</p> <p><u>Cultural</u>: Prune out and destroy blighted twigs, on which the fungus overwinters.</p>
<p>Mummy Berry (<i>Monilinia vaccinii-corymbosil</i>) As berries approach maturity, they become light pinkish to cream colored and drop to the ground as mummified fruit. Blighting of leaves, shoots, and flowers can occur. The fungus overwinters on the ground in mummified berries.</p>	<p><u>Chemical*</u>: Orbit, Tilt, Pristine, and Indar are the most effective materials. Indar should be tank mixed with captan to prevent rots. Make up to four applications, beginning at green tip and repeat at 7- to 10-day intervals through petal fall. Do not apply Pristine more than twice consecutively.</p> <p><u>Cultural</u>: Where mummy berry is a problem, early spring cultivation will aid in control by covering the overwintered berries.</p>
<p>Stem Blight (<i>Botryosphaeria dothidea</i>) One or more branches exhibit yellowed or reddened leaves, followed by death of the branch. Stems show brown discoloration of woody tissue, often only on one side of the stem. Penetration into the plant is primarily through wounds.</p>	<p><u>Chemical</u>: None.</p> <p><u>Cultural</u>: Pruning during coldest and driest winter months may reduce infections, since inoculum is at lowest levels during the winter. Avoid nitrogen applications after June, to allow shoots to harden before winter.</p>
<p>Twig Blight (<i>Phomopsis vaccinii</i>) Infection occurs in flower buds, and advances down the stem 2 to 6 inches, causing a dieback of the flower bearing stems. The fungus overwinters in twigs infected the previous year.</p>	<p><u>Chemical</u>: The spray schedule recommended for mummy berry would help in controlling twig blight. Indar (plus captan), Cabrio, Pristine, and ziram are the most effective materials.</p> <p><u>Cultural</u>: Prune and destroy discolored twigs during dormant pruning and summer.</p>

Grape Diseases

Disease, Pathogen, Symptoms	Control
<p>Anthracnose (<i>Elsinoe ampelina</i>) Also known as "bird-eye rot" because of the dark margin around the gray-colored spot on the fruit, this disease is usually confined to certain highly susceptible varieties such as Vidal blanc. Numerous spots may occur on shoots, leaves, tendrils, petioles and fruit stems.</p>	<p><u>Chemical*</u>: On anthracnose-susceptible varieties, liquid lime-sulfur applied during dormant season is helpful. During growing season, apply Pristine alternated with captan. Other fungicides may be needed for other diseases.</p> <p><u>Cultural</u>: Destroy pruned canes and clusters during dormancy.</p>
<p>Bitter Rot (<i>Greeneria uvicola</i>) Can be severe on certain varieties, such as Catawba. The fungus enters the berry from the stem, and a grayish discoloration of the berry begins on the stem side. The appearance of tiny black fungal fruiting bodies and a shriveling of the berry into a hard, dry mummy can cause this disease to be mistaken for black rot.</p>	<p><u>Chemical*</u>: Include captan, Abound, Flint, Pristine, or Sovran in late-season sprays. Control is needed in the weeks before harvest, but heed preharvest intervals for the fungicides.</p> <p><u>Cultural</u>: Destroy prunings and mummified berries.</p>
<p>Black Rot (<i>Guignardia bidwellii</i>) Very common and highly destructive. Berry symptoms begin as light brown, circular spots which rapidly discolor the entire berry. The berries shrivel to hard, black wrinkled mummies. Leaf spots are reddish-brown with dark margins. Dark spots form on green stems and tendrils.</p>	<p><u>Chemical*</u>: The most effective fungicides are Abound, Elite, Flint, ferbam, mancozeb, Rally, Sovran, and Ziram. Captan is also effective. The key spray times are immediately before bloom, at post-bloom, and 10 days later. Sprays prior to or after that period are also helpful.</p> <p><u>Cultural</u>: Destroy prunings and mummified berries.</p>
<p>Crown Gall (<i>Agrobacterium vitis</i>) Knots form on roots, crowns and sometimes, on canes. These galls may grow to several inches in diameter. The amount of damage to the plant varies from none to death of the plant. Winter-injured vines frequently become infected.</p>	<p><u>Chemical</u>: None.</p> <p><u>Cultural</u>: Plant winter-hardy varieties, avoid sites with a history of crown gall and avoid injuries to the canes.</p>
<p>Eutypa Dieback (Dead Arm) (<i>Eutypa lata</i>) Occurs only in older grapevines because infections develop slowly. Symptoms consist of dying arms and yellowed, cupped leaves on new growth in the spring. Leaves develop small necrotic spots and tattered margins. Infection occurs on trunk and main branches through pruning wounds. Spores are present throughout the year.</p>	<p><u>Chemical</u>: No registered products protect pruning wounds from infection.</p> <p><u>Cultural</u>: Avoid pruning during and before wet weather, and make clean, close cuts to encourage callusing. Identify infected plants in spring and remove and burn infected canes when weather is not rainy.</p>
<p>Downy Mildew (<i>Plasmopara viticola</i>) Light yellow spots form on upper sides of leaves, and a white, moldy growth is very noticeable on the undersides of the leaves. The affected leaves eventually become dry, brown and crumpled, and fall. Defoliation can be severe on some varieties in wet seasons.</p>	<p><u>Chemical*</u>: Abound, captan, copper plus lime, Presidio, Pristine, Ranman, Ridomil Gold Copper, Flint, Sovran, Tanos, and Zampro are the effective materials that can be applied in mid- to late-season, when downy mildew is active.</p>

Disease, Pathogen, Symptoms	Control
<p>Phomopsis Cane and Leaf Spot (<i>Phomopsis viticola</i>) Infected leaves have tiny, dark spots and are often puckered. Stems also show dark lesions. Infected berries form tiny pimple-like structures on the surface. These structures also form on the stems, which often turn light gray to white in winter.</p>	<p><u>Chemical*</u>: Captan, mancozeb, and Pristine are the most effective materials. Applications should begin shortly after bud break and continue through fruit set.</p> <p><u>Cultural</u>: Destroy prunings during dormant period.</p>
<p>Powdery Mildew (<i>Uncinula necator</i>) This disease usually does not significantly damage the American varieties. However, many of the vinifera varieties show a high degree of susceptibility. It appears as a white powdery growth on the leaves and berry clusters. Severely affected leaves turn brown and fall.</p>	<p><u>Chemical*</u>: Abound, Elite, Flint, Nova, Pristine, Procure, Rubigan, Sovran, sulfur, and Topsin M are the most effective materials.</p>

Raspberry Diseases

Disease, Pathogen, Symptoms	Control
<p>Crown Gall (<i>Agrobacterium tumefaciens</i>) Refer to crown gall of blackberries.</p>	<p>Same as for blackberry.</p>
<p>Gray Mold (<i>Botrytis cinerea</i>) In wet seasons, gray mold can cause a significant loss of flowers and fruit. Blossoms may show a blasting that may extend down the pedicel. Infected berries become covered with a gray, dusty fungal growth. Mature berries are more susceptible than young ones. Berries sometimes do not show gray mold until after harvest; they can quickly become a rotted mass in storage.</p>	<p><u>Chemical*</u>: Apply Elevate, Pristine, Switch, Rovral or Ronilan at early bloom and full to late bloom. Additional applications may be made, as allowed by the label.</p> <p><u>Cultural</u>: See Septoria leaf spot, below. Also, avoid excessive nitrogen fertilizer applications. Pick fruit frequently and early in the day as soon as plants are dry. Handle berries with care to avoid bruising.</p>
<p>Late Leaf Rust (<i>Pucciniastrum americanum</i>) This disease can occasionally be damaging to some varieties of red raspberries, although it occurs late in the season. This rust does not occur on black raspberries or blackberries. Small pustules filled with powdery yellow spores (not waxy like orange rust pustules) form on the underside of leaves. These spore masses can also occur on petioles, canes and berries. Badly infected leaves drop prematurely.</p>	<p><u>Chemical</u>: Nova, Abound, Pristine, or Cabrio may be helpful.</p> <p><u>Cultural</u>: The single-crop system of producing everbearing varieties should help control, because this fungus is thought to overwinter on raspberry canes.</p>
<p>Septoria Leaf Spot (<i>Septoria darrowii</i>) This is one of the most destructive raspberry diseases in Tennessee. Septoria can cause almost total leaf loss, especially on highly susceptible varieties such as Bababerry. Heritage seems to have some tolerance. Leaf spots have a tan to gray center surrounded by a thin, brown to purple border. The spots are circular and about 1/8 inch in diameter. Leaf spots caused by Septoria are similar to anthracnose leaf spots on raspberry or blackberry. Septoria leaf spots have tiny, black fruiting bodies in the center.</p>	<p><u>Chemical*</u>: Apply Abound, Cabrio, Pristine, Rally, captan, Tanos, or fixed copper. A 10- to 14-day schedule may be needed throughout the growing season, if weather conditions remain favorable for disease (warm, wet).</p> <p><u>Cultural</u>: Remove and destroy fruiting canes immediately after harvest. Keep the planting properly thinned and control tall weeds.</p>

Raspberry Disease, Pathogen, Symptoms	Control
<p>Phytophthora Root Rot (<i>Phytophthora</i> spp.) This disease is usually associate with heavy soils or portions of the planting that are the slowest to drain. Affected plants may show a general lack of vigor, or they may decline and die. The tissue underneath the epidermis on the main roots and crown is a brick red (later turning brown), rather than a normal white.</p>	<p><u>Chemical*</u>: Ridomil Gold EC can be applied to the soil in the spring and fall, and Aliette can be applied to the foliage up to 4 times per year. These chemical controls are not very effective if the cultural controls below are not followed.</p> <p><u>Cultural</u>: Plant only on well-drained sites. Planting on raised beds is helpful, and is important if drainage is occasionally inadequate. Avoid planting highly susceptible varieties.</p>
<p>Viral Diseases (Tomato Ringspot Virus, Mosaic, Leaf Curl) Virus diseases are a major problem in raspberries in the northern United States, but are relatively minor in Tennessee, presumably because of a lack of the proper vectors (carriers). The viruses seen in Tennessee are probably mosaic (a virus complex) and tomato ringspot.</p>	<p><u>Chemical</u>: None</p> <p><u>Cultural</u>: Plant only certified, virus-indexed stock. Destroy nearby wild or neglected brambles. Do not plant black or purple raspberries near red raspberries, because reds can tolerate mosaic and act as a reservoir of inoculum which will spread to the black raspberries, if the proper aphid species are present.</p>

Strawberry Diseases

Disease, Pathogen, Symptoms	Control
<p>Anthrachnose (<i>Colletrotrichum acutatum</i> and others) Fruit lesions are firm, slightly sunken, and may be tan, black, or natural color. Dark, sunken lesions form on all stem structures: stolons, petioles, and pedicels. Crown infections can result in the wilting and death of older plants. Daughter plants often turn dark and die before pegging down.</p>	<p><u>Chemical*</u>: Follow the gray mold program during bloom, with captan or thiram added to each spray. NOTE: The strobilurins (Abound, Cabrio, Pristine) are limited to 5 applications per crop, either individually or collectively. For this reason, beware of using the strobilurins during bloom, in order to save the allotment for the critical harvest period. During harvest, apply captan, Switch, Abound, Pristine, or Cabrio frequently, to control the fruit rot phase. Abound, Pristine, and Cabrio must be rotated with non-strobilurin fungicides. Control of the vegetative, (runner) phase in matted-row plantings is difficult.</p> <p><u>Cultural</u>: Buy plants from anthracnose-free nurseries. Mulching helps prevent spread. Delmarvel and Sweet Charlie have good resistance.</p>
<p>Gray Mold (<i>Botrytis cinerea</i>) A common fruit rot disease that can be very destructive in wet seasons. Gray mold often starts as a blossom blight and continues as a rot of green and ripe fruit. Many fruit infections begin when the fungus enters blossoms and remain latent until fruit begin to mature. In wet weather, diseased plant parts are covered with fuzzy brown to gray masses of fungal spores. Berries become more susceptible as they mature, and gray mold may continue to develop after harvest, becoming a rotted mass.</p>	<p><u>Chemical*</u>: To avoid resistance problems, choose any 3 of the following 4 fungicides and apply them in any order at weekly intervals during bloom: Elevate, Switch, Scala, or Pristine. Another choice would be captan or thiram (no resistance management needed). Since thiram provides deer and rabbit repellence, it would be preferable over captan where these pests are a problem. Effective control of the berry phase depends on a good spray program during bloom.</p> <p><u>Cultural</u>: Select a well-drained planting site. Renovate matted-row planting properly to thin plants. Avoid excessive nitrogen fertilizer rates. Mulch to reduce fruit contact with soil. In plasticulture plantings, remove winter-killed leaves before bloom period. Pick berries frequently and refrigerate promptly.</p>
<p>Common Leaf Spot (<i>Mycosphaerella fragariae</i>) The most common strawberry leaf disease in Tennessee; leaf spot can be severe on certain varieties. Most varieties show some leaf spot, but no real damage. Lesions are circular, 1/8 to 1/4 inch in diameter, and are purple with a white, gray or tan center. Favored by cool, wet weather.</p>	<p><u>Chemical*</u>: Apply Topsin M plus captan or thiram on susceptible varieties, beginning in early spring. Repeat at 10- to 14- day intervals until summer. Also needed in fall. Rally is very effective, but is not as broad spectrum.</p> <p><u>Cultural</u>: Plant resistant varieties. Use certified plants and select a well-drained site. Renovate properly to avoid overly-dense plantings, and do not over-fertilize.</p>
<p>Leaf Scorch (<i>Diplocarpon earliana</i>) Round to irregular, purple spots up to 1/4 inch in diameter form on the leaf surface. If the spots become numerous, large areas of the leaf become reddish-purple to brown and the entire leaf may turn brown and die. Not often seen in Tennessee.</p>	<p><u>Chemical</u>: Same materials as for leaf spot. Control needed during summer.</p> <p><u>Cultural</u>: Same as for leaf spot.</p>

Disease, Pathogen, Symptoms	Control
<p>Leaf Blight (<i>Phomopsis obscurans</i>) Spots are often irregular in shape, brown with a purple border, becoming large, V-shaped areas. Leaf blight is a hot-weather disease. Older leaves may become blighted and die in large numbers.</p>	<p><u>Chemical</u>: Same as for leaf spot.</p> <p><u>Cultural</u>: Same as for leaf spot.</p>
<p>Leather Rot (<i>Phytophthora cactorum</i>) This fruit rot occurs sporadically, but can occasionally cause economic losses. Disease development is very dependent on wet weather. Infected berries are light to dark brown, becoming tough and leathery. In early stages of disease development, infected ripe fruit are softer than healthy ones.</p>	<p><u>Chemical*</u>: Apply Ridomil Gold EC at fruit set, or Aliette, Cabrio, or Abound at 7-14 day intervals, beginning at bloom. Captan, applied as for gray mold control, is adequate for light cases of leather rot.</p> <p><u>Cultural</u>: Select a well-drained planting site, and mulch to prevent fruit contact with soil.</p>
<p>Powdery Mildew (<i>Sphaerotheca macularis</i>) Particularly severe in greenhouses and in tunnel production. Leaf edges curl upward, with reddish-purplish discoloration. Patches of white, powdery fungus mycelium may appear on leaves. Fruit set may be poor and immature fruit becomes hard and fails to ripen normally.</p>	<p><u>Chemical*</u>: On susceptible varieties in perennial culture, applications may be needed throughout the growing season, beginning at early bloom. For plasticulture, begin shortly after planting in fall. Rally, Procure, Quintec, or sulfur may be used at 14- to 21-day intervals.</p>
<p>Red Stele (<i>Phytophthora fragariae</i>) Red stele is not as common as it once was, because many of today's varieties are resistant to it. It is caused by a soil-borne fungus that is most damaging in heavy, wet-natured soils. Plants first appear stunted and dull in color, then wilt and eventually die. Roots decay and show reddish or brown cores (steles). Roots become devoid of lateral rootlets, giving them a rat-tailed appearance.</p>	<p><u>Chemical*</u>: Apply Ridomil Gold EC before bloom and again in the fall. Aliette can be applied when growth begins and repeated at 30-60 day intervals.</p> <p><u>Cultural</u>: Avoid sites having low-lying, clay soils. Plant on raised beds. Purchase certified disease-free plants of resistant varieties. Do not plant in fields with a history of red stele. The causal fungus can remain in the soil up to 13 years.</p>
<p>Verticillium Wilt (<i>Verticillium albo-atrum</i>) This disease does not occur frequently on strawberries in Tennessee. Most of the varieties grown are resistant to it. This disease is favored by cool weather. The symptoms are similar to those for red stele, except Verticillium does not cause red discoloration in the roots.</p>	<p><u>Chemical</u>: Preplant fumigation.</p> <p><u>Cultural</u>: Adequate control can be obtained without fumigation by planting resistant varieties and avoiding sites planted to susceptible crops such as tomato, potato, eggplant, okra and pepper.</p>

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