



CORNELL COOPERATIVE EXTENSION - SUFFOLK COUNTY

INSECT AND PLANT DISEASE DIAGNOSTIC LABORATORY

EDUCATION CENTER
423 GRIFFING AVENUE
RIVERHEAD, NY 11901
HORT INFO LINE 631.727.4126



Cornell University
Cooperative Extension
of Suffolk County

BAYARD CUTTING ARBORETUM
MONTAUK HWY. PO BOX 463
OAKDALE, NY 11769
HORT INFO LINE 631.581.4223



Brown Rot

Introduction: Brown rot is a major disease of all commercially grown stone fruit and can cause major crop losses in peaches, cherries, plums, prunes, nectarines, and apricots. The fungus, *Monilinia fructicola*, can infect the blossoms, fruit, spurs (flower and fruit bearing twigs), and small branches. Favorable weather conditions can lead to fruit infections causing entire crop loss on the tree or in storage. Improved disease management strategies and the availability of more effective fungicides have reduced disease losses; however, it is still critical to carefully manage this disease, especially just before ripening, during, and after harvest of fruit.



Fig. 1. Blossom blight on peach (top) & soft brown spots on peach (bottom) (Clemson University, USDA Cooperative Extension Slide Series www.bugwood.org)

Symptoms: Typical disease symptoms are similar on all stone fruit, and include blossom and twig blight, cankers, and fruit rot. Occasionally, a related fungus *M. laxa* will infect young leaves and cause a terminal shoot blight. Apricot leaves may also develop small lesions resembling those of the shot-hole fungus, *Wilsonomyces carpophilus*.

Blossoms: Blossom infections not only reduce fruit set, but increase the inoculum available for fruit infections later in the season. Infected flowers turn brown, wither, and die (Fig. 1). In some instances, they may become fixed to twigs as a gummy mass, in others, they may drop. Susceptibility to blossom blight is variable among the stone fruit with apricot being the most susceptible, followed by prune, sweet cherry, peach, sour cherry, and plum, respectively. Controlling blossom infections is key to managing the development of the disease in the orchard

Fruits: Brown rot infections on fruit first appear as soft brown spots (Fig. 1), which rapidly expand and are covered with powdery masses of tan colored spores, called conidia (Fig. 2). Infected fruits rot very rapidly, and shrink into a wrinkled "mummy" as it dries on the tree (Fig. 3). Both immature and mature fruit infected with brown rot tend to remain on the tree. In some areas latent fruit infections may occur, which become active as the fruit ripens. These latent infections have not been reported in the Eastern United States, except on plum.

Twigs: If infected blossoms do not drop off, the fungus may grow through the flower stem (pedicel) and into the twig below. Twigs develop elliptical cankers with profuse gumming at the margin between diseased and healthy tissue. Leaves on these infected shoots turn brown and wither, but remain attached. In some instances, twigs are girdled and killed. During wet weather in May and June, the fungus sporulates on the surface of infected twig cankers. These summer spores are easily detached and are carried by wind, rain, or insects to developing fruit. Cankers enlarge from season to season, and sporulation may continue on large cankers for 4 years or more. Existing cankers may be colonized by more aggressive canker fungi such as *Leucostoma* spp.

Signs (visible presence of the fungus): Under wet conditions, powdery tufts (sporodochia) of brown gray spores (conidia) are visible on the outside of infected flower shucks, and on infected fruit or twig surfaces. These tufts may occur in concentric rings on fruit surfaces.

Disease Cycle: *Monilinia fructicola* over winters in dried infected fruit, called mummies, or in infected twig and branch cankers. Mummies remain hanging in the trees or scattered on the orchard floor during the winter. Both may produce spores which infect blossoms and young fruit in the spring. Two types of spores are possible: ascospores and conidia.

Ascospores are produced from apothecia, a mushroom-like structure that occurs only on mummies which have fallen to the ground and are partially covered with soil. Apothecia are much more common in the southeastern United States and are rarely observed in New York. Conidia are produced in abundance on mummies and infected twigs and may be spread by wind and rain.

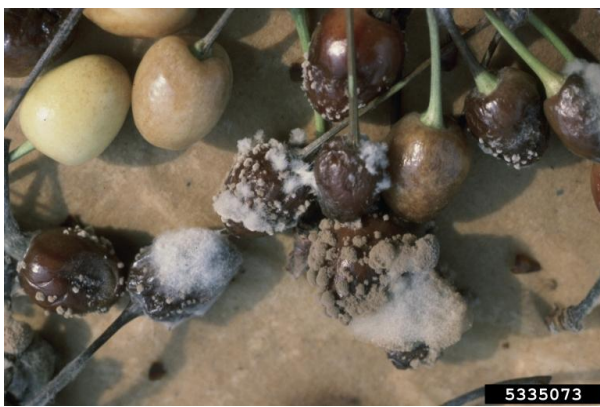


Fig. 2. Cherry fruit infected with brown rot. Note the powdery tan colored masses on conidia on the fruit. (Mary Ann Hansen, Virginia Polytechnic Institute and State University, www.Bugwood.org)

Conditions Favoring Infection: If a film of water on blossom surfaces from dew or rain is present for 5 hours or more, spores germinate and penetrate plant cells, causing infections. Although conidia can germinate and infect at temperatures between 32 and 90° F, temperatures ranging from 60 to 70° F, in combination with wet weather, favor disease development. However, serious blossom blight may also result at lower temperatures if prolonged wetting periods occur. Any type of injury will provide a point of entry for the fungus: hail damage, insect feeding wounds, bird pecks, fruit cracking, limb rubs, twig punctures, picking/packing injuries.

Control Measures

Resistant Varieties: Most varieties of stone fruit are susceptible at various levels of degree. The following chart lists the brown rot susceptibility of a variety of peach cultivars.

Peach Cultivar	Brown Rot Resistance Rating ^z	Peach Cultivar	Brown Rot Resistance Rating ^z	Peach Cultivar	Brown Rot Resistance Rating ^z
Ambergem	S	Golden Jubilee	S	Redhaven	S
Babygold No. 5	R	Hale Harrison Brilliant	HS	Redskin	S
Belle of Georgia	HS	Halehaven	HS	Richaven	S
Blake	S	J H Hale	S	Rio Oso Gem	S
Cardinal	S	Jefferson	S	Shippers Late Red	S
Coronet	HS	Jerseyland	S	Southhaven	HS
Cresthaven	S	Keystone	S	Southland	S
Dixired	S	Late Sunhaven	S	Springold	S
Earlired	S	Loring	S	Sullivan Elberta	S
Early East	HS	Madison	S	Summercrest	HS
Early Sunhaven	S	Maybelle	HS	Sunhaven	S
Elberta	R	Mayflower	HS	Sunhigh	S
Early Red Free	S	Monroe	S	Triogem	S
Gemmers Elberta	S	Raritan Rose	HS	Washington	S
Glohaven	R	Redbird	HS		

^z**R** = resistant. Control only needed under high disease pressure. **S** = susceptible. Control usually needed where disease is prevalent. **HS** = highly susceptible. Control always needed where disease is prevalent. These cultivars should receive first priority when control is called for. (chart courtesy of West Virginia University, Kearneysville Tree Fruit Research & Education Center)

Sanitation: Sanitation is critical to effectively controlling brown rot in high pressure orchards. Mummied fruit and cankers should be pruned during the dormant season and either burned or buried deeply in the soil. Removing wild or neglected stone fruit trees around your orchard will reduce the reservoir of spores capable of infecting blossoms and fruit. During the season, it is important to remember that fruits thinned after pit hardening are more likely to become infected on the orchard floor than those thinned prior to pit hardening, thus thinning should be done as early as possible. Finally, remove and destroy all dropped and rotted fruit from the orchard floor, and over ripe or rotting fruit from packing sheds to reduce fruit infections on stored fruit.

Minimize Fruit Injury: Fruit feeding insects create wounds for brown rot infections. Controlling plum curculio, oriental fruit moth, and tarnished plant bug can minimize this damage. Take special care during harvest and packing not to puncture or bruise fruit, as these injuries will also serve as entry sites for the pathogen. Cooling or refrigerating fruit to as close to 32° F as possible after harvest will slow the development of the pathogen in storage.

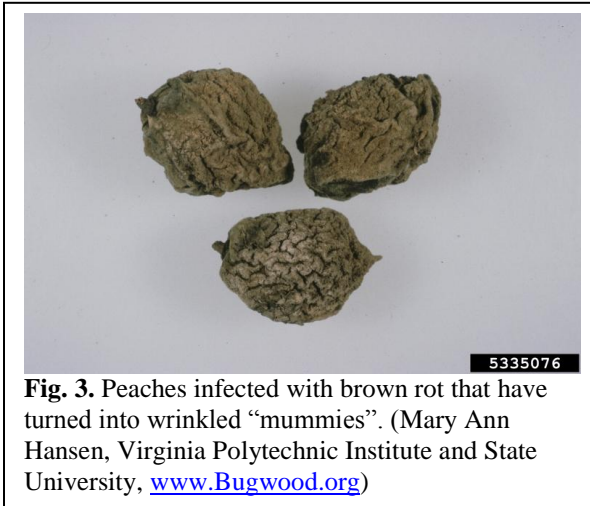


Fig. 3. Peaches infected with brown rot that have turned into wrinkled “mummies”. (Mary Ann Hansen, Virginia Polytechnic Institute and State University, www.Bugwood.org)

Fungicides: Proper use of both protective and systemic fungicides protects flowers and fruit, and reduces both the amount of sporulation on infected tissue and sources of overwintering inoculum. In all cases, SI fungicides should not be used routinely throughout the season for BOTH blossom blight and fruit rot control.

Apricots: Apricots are the stone fruit most susceptible to blossom blight. At least one protective spray should be applied each year, and repeated at full bloom and/or petal fall if warm wet conditions exist during bloom. A shuck split application is also important.

Cherries: Blossom blight is much more serious on sweet cherry than on sour cherry. Sweet cherries (not sour) are also very susceptible to infection the first few weeks after fruit set, and a petal fall spray is recommended if the weather is warm and wet. Superior brown rot fungicides should be used on sweet cherries during the 3-week interval before harvest if disease pressure is high.

Peaches: More than one blossom blight spray is rarely needed unless disease pressure is high. Petal fall applications are necessary only if a prior brown rot spray was not applied, and conditions continue to be warm and wet. Fruit are very susceptible to infection 1-3 weeks after shuck split, so shuck split and first cover sprays are important, especially in wet weather.

Plums and Prunes: If large numbers of fruit were left unharvested the year before, or conditions are warm and wet, blossom blight may be a problem. Lower temperatures with prolonged wetting periods may also result in infection. If not, direct white bud, bloom and petal fall sprays at black knot instead. Plum fruit appear to be very susceptible for the first few weeks after setting; shuck split and first cover sprays are important.

Cherry: Apply azoxystrobin (not near apples), captan, chlorothalonil, copper sulfate, myclobutanil, propiconazole, or a multipurpose spray (with captan, sulfur, or neem oil) that is labeled for brown rot according to label directions. Sprays containing captan may cause leaf injury on some sweet cherry varieties. The critical times to manage brown rot are the first three weeks after petal fall and the last three weeks before harvest.

Peach, nectarine, and apricot: Apply azoxystrobin (not near apples), captan, chlorothalonil, copper soap (copper octanoate), copper sulfate, myclobutanil, propiconazole, or a multipurpose spray (with captan, or sulfur, or neem oil), according to label directions. **See labels to determine whether a particular pesticide can be applied to peach, apricot, or nectarine; not all pesticides are labeled for application to all three crops.** The critical times to manage brown rot are the first three weeks after petal fall and the last three weeks before harvest.

Plum and prune: Apply azoxystrobin (not near apples), captan, chlorothalonil, copper soap (copper octanoate), myclobutanil, propiconazole, or a multipurpose spray containing neem oil, or sulfur according to label directions. Sprays containing captan or propiconazole may cause leaf injury on Stanley plum. The critical times to manage brown rot are the first three weeks after petal fall, and the last three weeks before harvest.

Reprinted from *Brown Rot*. Bill Turechek, Cathy Heidenreich and Tom Burr. NYS IPM Tree Fruit Crops Fact Sheet Series (Revised). 2001

Pesticide recommendations obtained from *2009-2010 Pest Management Around the Home Part II – Pesticide Guidelines*. Copies are available from Cornell Cooperative Extension – Suffolk County.

The Pesticide Management Education Program (PMEP), in cooperation with the New York State Department of Environmental Conservation (NYSDEC), maintains a web site with a searchable database for pesticide products currently registered in New York State. Individuals who have Internet access can locate currently registered products containing the active ingredients suggested above at <http://pmez.cce.cornell.edu/pims/current> (NYS PIMS).

This publication contains pesticide recommendations. Changes in pesticide regulations occur constantly and human errors are still possible. Some materials mentioned may no longer be available, and some uses may no longer be legal. All pesticides distributed, sold or applied in New York State must be registered with the New York State Department of Environmental Conservation (NYSDEC). Questions concerning the legality and/or registration status for pesticide use in New York State should be directed to the appropriate Cornell Cooperative Extension Specialist or your regional NYSDEC office. Read the label before applying any pesticide.