

## Brown Rot on Apricot and Other Stone Fruits

Amy D. Ziems, Extension Educator, Plant Pathology

Brown rot is a fungus that affects apricots, nectarines, peaches, plums, and other stone fruits. Recognizing symptoms and understanding the disease cycle can help you control it.

Brown rot is a common and destructive disease affecting apricot and other stone fruits (cherry, nectarine, peach, and plum) in Nebraska. This fungus may attack blossoms, fruit spurs (flower and fruit bearing twigs), and small branches. Most damage from this disease occurs when fruit becomes infected just prior to ripening, or during and after harvest. When environmental conditions are conducive, the entire crop can completely rot on the tree. Following harvest, fruit that is not kept cool during storage may rot in two or three days.

### Symptoms

The symptoms of brown rot are similar on all stone fruits. Symptoms first appear in the spring as the blossoms are beginning to open. Infected blossoms turn brown, wither, and die.



**Figure 1.** Brown rot infecting apricots and producing spores on the surface of infected apricots. These spores can infect other fruit. Photo courtesy of Loren Giesler, University of Nebraska–Lincoln.

Blossoms may be covered with a brownish-gray mass of spores. Occasionally the blossoms may become fixed to twigs as a gummy mass; however, the blossoms usually remain attached throughout the summer. Infection at this stage reduces fruit set but increases inoculum levels available for fruit infections later in the season.

The young, developing fruit are normally resistant but can become infected through wounds (e.g., insect feeding, hail damage). As the fruit matures it becomes susceptible to infection even in the absence of a wound(s). Initially symptoms appear as soft brown spots, which quickly expand and produce a mass of tan powdery spores called conidia (*Figure 1*). As the infection proceeds, it will cover the entire fruit, causing the fruit to rot rapidly. The fruit then dries and shrinks into a wrinkled “mummy” (*Figure 2*). Typically the rotted and mummy fruit remain attached to the tree. Fruit infections may spread rapidly, especially if weather conditions are conducive for disease development and the fruit are touching one another.

The fungus may infect the spurs of the tree through infected blossoms and/or fruit. Twigs develop an elliptical canker with profuse gumming at the margin between healthy and infected tissue. Infected twigs may become girdled and killed. Leaves attached to an infected twig typically turn brown and wither (twig blight). Occasionally, succulent shoots are infected by direct penetration near their tip.



**Figure 2.** Brown rot mummy from an infected apricot with production of fungal spores on the surface. Photo courtesy of Loren Giesler, University of Nebraska–Lincoln.

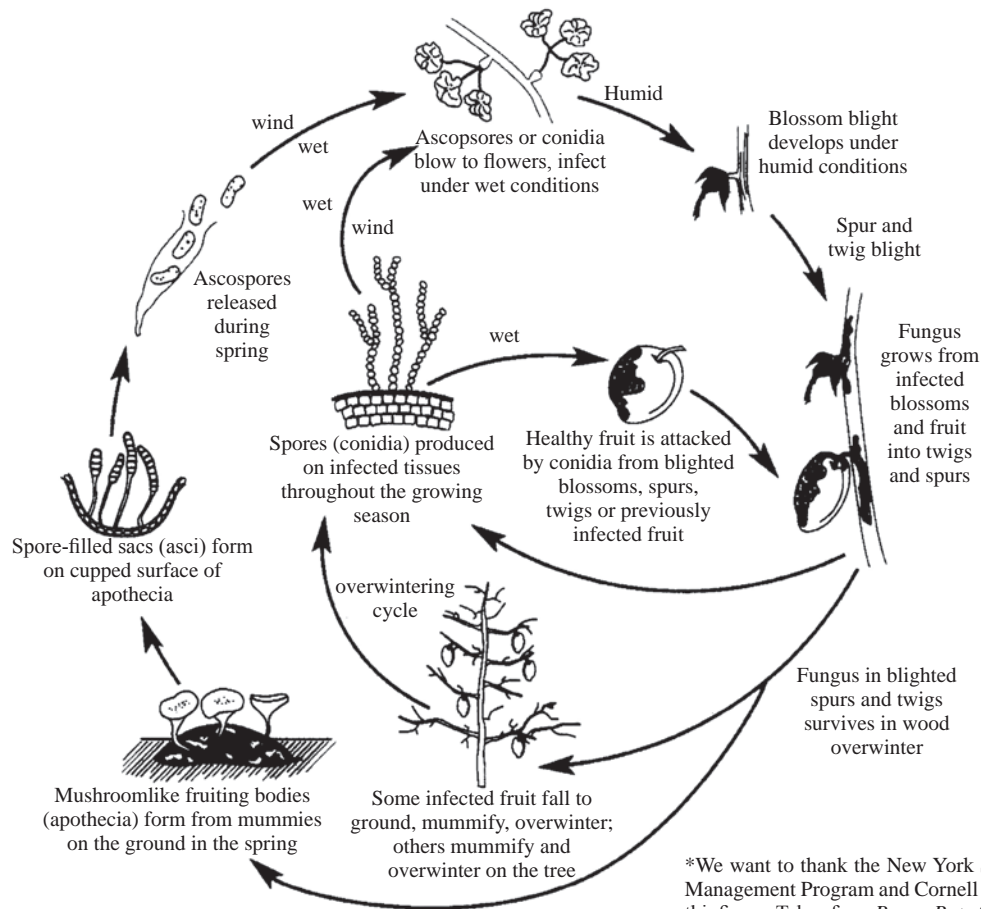


Figure 3. Brown rot disease cycle.\*

Table I. Reaction of selected peach cultivars to brown rot<sup>a</sup>

Resistant <sup>b</sup>	Moderately Resistant	Susceptible	Highly Susceptible
Babygold No. 5	Catherina	Allstar <sup>TM</sup>	Hale Harrison Brilliant
Early Redhaven	Redhaven	Blazingstar <sup>TM</sup>	Halehaven
Elberta	Vinegold	Blushingstar <sup>TMc</sup>	Maybelle
Garnet Beauty	Virgil	Bounty	Mayflower
Glohaven	Vivid	Brighton	Redbird
Harbrite	Vulcan	Coralstar <sup>TM</sup>	Southhaven
Harcrest		Cresthaven	Summercrest
Harken		Dixired	
Harrow Beauty		Glowingstar <sup>TM</sup>	
Harrow Diamond		Golden Jubilee	
Harson		Jim Wilson	
		Loring	
		Redskin	
		Redstar <sup>TM</sup>	
		Risingstar <sup>TM</sup>	
		Springcrest	
		Starfire <sup>TM</sup>	
		Veeglo	
		White Lady <sup>c</sup>	

<sup>a</sup>Modified from West Virginia University Kearneysville Tree Fruit Research and Education Center, 67 Apple Harvest Lane, Kearneysville, WV 25430, Brown Rot *Monilinia fructicola*, by A.R. Biggs, K.D. Hickey, and K.S. Yoder and Ontario Ministry of Agriculture, Food and Rural Affairs, 1 Stone Road West, Guelph, ON N1G 4Y2, Peach and Nectarine Cultivars by K. Slingerland and J. Subramanian.

<sup>b</sup>Resistant = control needed under high disease pressure, Moderately Resistant = control is needed under moderate disease pressure, Susceptible = control usually needed where disease is prevalent, Highly Susceptible = control always needed where disease is prevalent. These cultivars should receive first priority when control is necessary.

<sup>c</sup>White flesh peaches.

**Table II. Reaction of selected apricot cultivars to brown rot.**

<i>Resistant<sup>a</sup></i>	<i>Moderately Resistant</i>	<i>Susceptible</i>
Goldcot <sup>b</sup>	Harglow	Chinese Apricot
Harcot <sup>b</sup>	Harlayne	Puget Gold
Hargrand <sup>b</sup>	Harojoy <sup>TM</sup>	Tomcot
Harogem <sup>b</sup>	Harostar <sup>TM</sup>	
Velvaglio <sup>c</sup>	Harval <sup>d</sup>	
	Vivagold <sup>e</sup>	

<sup>a</sup>Resistant = control needed under high disease pressure, Moderately Resistant = control is needed under moderate disease pressure, Susceptible = control usually needed where disease is prevalent.

<sup>b</sup>Source: 'Hargrand' Apricot. 1981. Layne, R.E. HortScience 16(1):98-100.

<sup>c</sup>Source: 'Velvaglio' Apricot. 1979. Bradt, O.A. and Andersen, E.T. HortScience 14(1):83.

<sup>d</sup>Source: 'Harval' Apricot. 1991. Layne, R.E. HortScience 26(4): 424-425.

<sup>e</sup>Source: 'Vivagold' Apricot. 1979. Bradt, O.A. and Andersen, E.T. HortScience 14(1):82.

**Table III. Fungicides<sup>a</sup> available for brown rot control on stone fruits.**

<i>Fungicide Active Ingredient</i>	<i>Trade Name</i>	<i>Contact (C)/ Systemic (S)<sup>b</sup></i>	<i>Commercial (C)/ Homeowner (H) Use</i>
Azoxystrobin	Heritage (Syngenta Crop Protection)	S	C
<i>Bacillus subtilis</i>	Serenade ASO (AgraQuest Inc.)	C	C
Captan	Captan 50 Wettable Powder (Arysta LifeScience North America)	C	C
	Captan 80 WDG (Arysta LifeScience North America)	C	C
	Fruit Tree Spray Concentrate (Bonide Products Inc.) <sup>c</sup>	C	H
	Gordon's Liquid Fruit Tree Spray (PBI/Gordon Corporation) <sup>c</sup>	C	H
	Rescue One Spray Protection (Control Solutions Inc) <sup>c</sup>	C	H
Chlorothalonil	Fung-Onil (Bonide Products Inc.)	C	H
Copper	Kop-R-Spray (Lilly Miller Brands)	C	H
	Liquid Copper Fungicide Concentrate (Bonide Products Inc.)	C	H
Cyprodinil	Vanguard WG (Syngenta Crop Protection Inc)	S	C
Dicloran	Botran 75-W Fungicide (Gowan Company)	C	C
Fenbuconazole	Indar 2F (Dow AgroSciences)	S	C
Fenhexamid	Elevate 50 WDG (Arysta LifeScience North America)	C	C
Iprodione	Rovral Brand 4 Flowable Fungicide (Bayer CropScience)	S	C
Propiconazole	Bumper 41.8 EC (Makhteshin-Agan of North America)	S	C
	Infuse Systemic Disease Control (Bonide Products Inc.)	S	H
	Orbit (Syngenta Crop Protectio)	S	C
	PropiMax EC (Dow AgroSciences)	S	C
Sulfur	Citrus, Fruit & Nut Orchard Spray Concentrate (Bonide Products Inc.)	C	H
	PolySul Summer and Dormant Spray (Lilly Miller Brands)	C	H
	Sulfur Dust (Lilly Miller Brands)	C	H
Tebuconazole	Orius 45DF (Makhteshin-Agan of North America)	S	C
Thiophanate-Methyl	Thiophanate Methyl 85 WDG (Makhteshin-Agan of North America)	S	C
	T-Methyl 70W WSB (Arysta LifeScience North America)	S	C
	Topsin (Cerexagro-Nisso LLC & United Phosphorus Inc.)	S	C
Triflumizole	Procure 50WS (Chemtura Corporation)	S	C

<sup>a</sup>This list is presented for information only and no endorsement is intended for products listed nor criticism meant for products not listed. Consult the product label for specific application rates and plant growth stage. Read the label carefully before making any application.

<sup>b</sup>Contact fungicides remain on the plant surface where it is applied but does not go any deeper, it has no after-infection activity. Systemic fungicide is absorbed into plant tissue and may offer some after-infection activity.

<sup>c</sup>Product also contains an insecticide.

## Disease Cycle

Brown rot is caused by the fungus, *Monilinia fructicola*. This fungus overwinters in mummified fruits (either on the ground or still on the tree) and in twig and branch cankers produced the preceeding year. Sporulation of the fungus is favored by moderate temperatures (55° to 77°F) and wet weather; however, spores can be produced at temperatures ranging between 32° and 90°F. The spores are spread to blooms, new shoots and/or fruit by wind, rain-splash, and insects such as bees or beetles (*Figure 3*). The spores infect plant tissues after being exposed to a water film for five hours or more.

## Management

Effective management includes both cultural and chemical approaches. The integration of multiple tactics provides the best long-term management option.

## Resistant Cultivars

The majority of commercial stone fruit cultivars are susceptible to brown rot infection when favorable conditions are present during the three-week ripening window. *Tables I and II* lists the susceptibility of some peach and apricot cultivars currently available.

**Table IV. Stone fruit tree growth stage description.**

<i>Growth Stage</i>	<i>Description</i>
Dormant	No swelling visible
Bud Swell	Swelling buds becomes noticeable and no green tissue is visible
Side Green	Green or white tissue is visible on the sides of the bud
Bud Burst/Green Tip/ Tight Cluster	The top of the bud has opened and the individual flower buds are visible. Cherry and plum fruit buds have multiple flowers
Early White Bud	The flower buds continue to develop. The buds open and the individual flowers separate. The white petals are visible
White Bud/ Pink bud (Peaches)/Popcorn	This is the stage just before bloom
First Bloom	When the first flowers open
Full Bloom	All or most of the flowers on the tree are open
Petal Fall	When the petals are falling off the tree
Shuck Split/1st to 2nd Cover	When the growth of the fruit splits the shuck. The shuck is formed from the floral cup
Pit Hardening	Not really a visible stage this is when the pit of the fruit becomes hard. This is tested by trying to cut the fruit in half
Straw-colored Fruit	The ground or background color of the fruit changes from green to yellow
Coloring Fruit	The fruit color changes from yellow to red
First Harvest	First picking of ripe fruit, if there are multiple pickings as in peaches, plums, and apricots for fresh market
Harvest	The fruit is ripe and ready to harvest

**Sanitation — Cultural Control**

Sanitation is critical in effectively managing brown rot. During the dormant season, mummified fruit and cankers should be pruned and either burned, buried deeply in the soil, or sent to the landfill. This will reduce the amount of overwintering inoculum present. Remove wild or neglected stone fruit trees in the area that serve as a reservoir of spores. During the growing season, remove and destroy overripe or rotting fruit on the orchard floor and/or packing sheds to reduce the amount of secondary inoculum.

**Minimize Fruit Injury — Cultural Control**

Fruit feeding insects create openings and wounds on the fruit where brown spot infections occur. Controlling those insects will reduce the amount of fruit infection. It is important to remember that any type of wound on the fruit surface is a prime location for brown rot infection. Take special care during harvesting and packing to prevent punctures and bruising. Cooling or refrigerating the fruit as close to 32°F as possible immediately following harvest will slow the development of the fungus in storage.

**Chemical Control**

Regular, well-timed fungicide sprays effectively control brown spot infections when used in combination with cultural methods. Properly using both protective and systemic fungicides (*Table III*) protects flowers and fruits. It also reduces the amount of sporulation on infected tissue and reduces overwinter inoculum levels.

*Apricots:* Apricots are very susceptible to blossom blight. Typically one protective spray should be applied each year and repeated at full bloom and/or at petal fall (*Table IV*) if warm conditions exist during bloom. To protect the fruit, a shuck-split (*Table IV*) application also should be considered.

*Cherries:* Sweet cherry is more susceptible than sour cherry to blossom blight. For sweet cherry, a petal fall (*Table*

*IV*) spray is recommended if the weather is warm and wet because the fruit is very susceptible the first few weeks after fruit set.

*Peaches and Nectarines:* For these stone fruits, rarely more than one blossom blight spray is needed unless the disease is severe. A fungicide application at petal fall (*Table IV*) is only necessary if an earlier application was not made and conditions continue to be warm and wet. An application at shuck split and first cover (*Table IV*) sprays are important when the weather is wet because the fruit is the most susceptible one to three weeks following shuck split.

*Plums and Prunes:* An application to prevent blossom blight is only needed if there is a large number of unharvested fruit still remaining on the tree. Fungicide application at shuck split and first cover (*Table IV*) spray are important for plums because the fruit is very susceptible for the first few weeks after setting.

**This publication has been peer reviewed.**

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**Index: Plant Diseases  
Fruit**

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