Lect. 10

Postharvest decays of stone fruits

Brown rot: *Monilinia fructicola*

Gray mold: *Botrytis cinerea*
Rhizopus rot: *Rhizopus stolonifera*
Sour rot: *Geotichum candidum*
Mucor Rot: *Mucor piriformis*
Peach scab: (Bacterial) *Cladosporium carpophilum*

Postharvest decays of stone fruits

DISEASE: Brown rot of stone fruits

Monilinia fructicola, M. laxa,* and *M. fructigena
The first published description of a brown rot fungus on decaying fruit was in 1796.
Different species of brown rot fungi were later discovered.
The fruit-rotting fungi were placed in the genus *Sclerotinia* in the late 1800s and were transferred to the new genus *Monilinia* in 1928.

Rot of peach fruit by *Monilinia fructicola* and sporulation of the pathogen

HOSTS: Stone fruits (peach, nectarine, cherry, plum), almond, and occasionally some pome fruits (apple and pear)

Worldwide, brown rot is the most important disease risk for stone fruits in warm, humid climates.
It is the primary disease for which fungicides are applied to stone fruits.

blight of blossoms and twigs

Symptoms and Signs
The brown rot fungi cause a blight of blossoms and twigs and a soft decay of fruits of peaches, cherries and plums.

soft decay of fruits of peaches

soft decay of fruits of plums

soft decay of fruits of cherries

There are two distinct phases of this disease

1. Blossom and twing blight

This phase of the disease occurs in early spring when the trees are blooming.


The anther and pistil of the flower are infected initially

The fungus then invades the floral tube, the fruit, stem, and usually the twig to which the stem is attached
Results a necrotic area in the woody tissue termed a "canker"



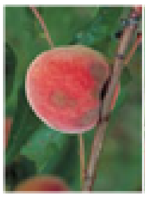
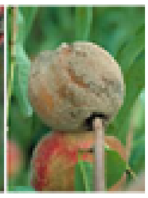
"canker"

Sometimes juicy twigs and shoots become infected directly when there are extended periods of both moisture and warm temperatures (20 to 28ºC
Under moist or humid conditions, ash-gray-brown colored sporodochia bearing conidia form on the surface of diseased blossoms and twigs.

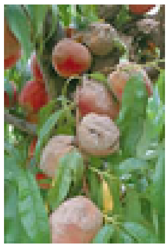
Significance

Worldwide, brown rot poses the greatest disease risk for crop loss where stone fruits are grown in warm, wet climates.
The disease has been studied for almost 200 years in Europe, for more than a 100 years in North America, and in other parts of the world as the fruit industries developed.
Until the discovery and development of highly effective fungicides during the last quarter to half-century, significant losses from brown rot could be expected when fruit ripening coincided with periods of rainfall.

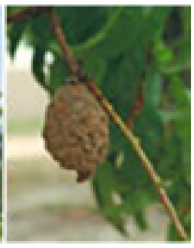
2. Fruit rot

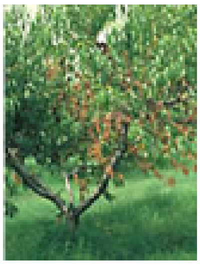
Fruit susceptibility to brown rot increases during the 2 to 3 week period prior to harvest.
Initially, tan-brown, circular spots are visible on the fruit.
Under humid conditions, ash-gray-brown masses of conidia develop on these lesions.



If environmental conditions are wet and warm during fruit ripening, the entire crop can literally be destroyed "overnight"

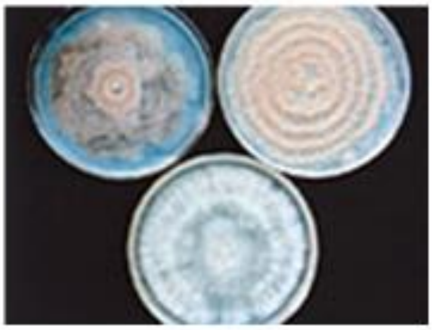



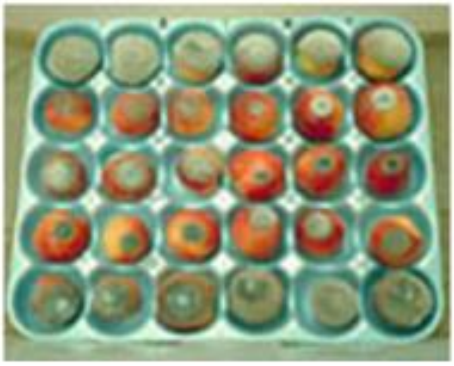
Diseased fruit that do not fall to the ground dehydrate and become shriveled "mummies“



Sometimes the fungal infection extends from the fruit into the twig and branch

M. fructigena occurs on both stone and pome fruits in Europe, but does not cause the extensive crop loss caused by *M. laxa* and *M. fructicola*.
The mycelial growth characteristics of the three *Monilinia* species vary when they are grown on 2% potato-dextrose agar (PDA) medium.
Isolates of *M. fructicola* can have different fruit rotting and sporulation capabilities.





Asexual reproduction

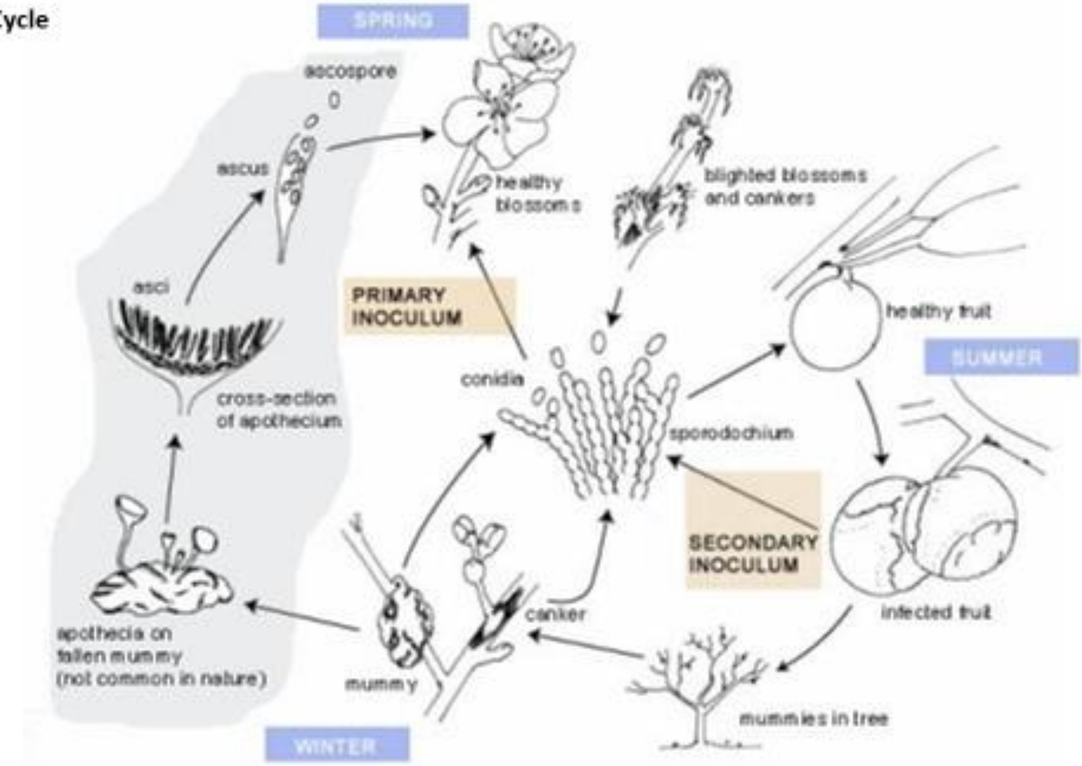
Conidia (asexual spores) are produced on tufts of conidiophores called sporodochia.

The conidia are hyaline (colorless), lemon-shaped. Under ideal conditions, conidia germinate within 3 to 5 hours. Extensive mycelial growth can occur within 24 hours.

Sexual reproduction

They produce ascospores (sexual spores) in asci that are produced on apothecium.
Apothecia can be 5-20 mm (up to nearly an inch) in diameter and are borne on mummified fruit that have fallen to the ground.
Apothecia are rarely observed in most areas.

Disease Cycle



Drawing courtesy Vickie Brewster

Epidemiology

The opening blossoms are the first emerging susceptible tissue in the spring.

Sources of blossom blight inoculum are mummies, infected peduncles, and cankers. Conidia from these sources are disseminated by splashing or wind-blown rain.

Environment conditions

Blossom infection is highly dependent on wetness duration and temperature.

For blossom infection to occur at 10ºC, 18 hours of wetting are necessary; in contrast, at 24ºC only 5 hours are necessary.

The time required for symptoms of blossom blight to develop may be only a few days to 1 or 2 weeks depending on the temperature.

The first evidence that infection has occurred may be yellow and wilting leaves on branches or twigs.

It takes very few blighted blossoms to cause severe fruit rot if environmental conditions are optimal as fruit ripen.

Warm, wet or humid weather during the 2 to 3 week period prior to harvest increases disease severity

Inoculum sources for fruit infection include blighted blossoms, cankers, mummies from the previous year, and diseased fruit in the tree or on the orchard floor from thinning practices.

Insects, such as June beetles, which are attracted to overripe fruit, can increase disease severity not only by carrying the fungal conidia but also by creating wounds as they feed.
Wet, warm conditions also increase overwintering inoculum available for blossom infections the following spring.

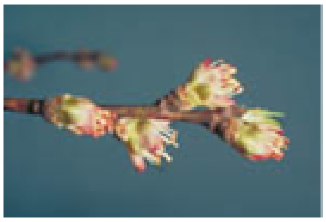
Disease Management

Orchard location is important.
Trees planted in orchards having poor air movement, and thus slow drying conditions, are more likely to have blossom blight and brown rot.
Successful management of blossom blight and brown rot involves a combination of sanitary practices to reduce the amount of initial inoculum and the careful use of fungicides.

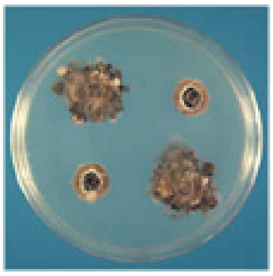
Sanitation practices

The removal of diseased fruit mummies and blighted twigs from the trees and removal of fruit and mummies from the orchard floor following the final harvest can substantially reduce sources for overwintering inoculum.
The orchard floor can be kept clean of vegetation, or the area can be raked or lightly cultivated to bury mummies and prevent the development of apothecia.
However, care must be used not to cultivate too deeply to avoid damaging tree roots.

Fungicides



Blossom blight occurrence is very much dictated by the weather conditions.
In areas where blossom infection occurs, 1 to 3 fungicide sprays beginning just as the blossoms open (Fig) control blossom blight.
For brown rot control, 2 to 3 fungicide sprays are usually applied during the 2 to 3 week period leading up to harvest.
When combined with good cultural practices, currently registered fungicides are highly effective.
In addition, insect control, especially for insects that directly damage fruit, is important during this period.



The use of fungicides, however, has not been without its problems.
When highly effective and specific fungicides were used, brown rot fungi became resistant to them.

Post-harvest control

Practices used during harvest can significantly impact the amount of fruit decay following harvest.
Picking and handling fruit carefully to avoid injuries, cooling fruit promptly after harvest, using clean containers to hold the fruit, and timely harvesting of ripening fruit all help reduce post-harvest brown rot problems.
Fungicides are commonly used to reduce post-harvest fruit decay, but there has been considerable research on alternative control methods.
Antagonistic isolates of *Bacillus and Pseudomonas* spp. have been used experimentally as biological control agents.
Substances that induce fruit resistance, such as calcium treatments applied to fruit several weeks before harvest, or surface coatings that provide a physical barrier have also been evaluated in experiments, but are not yet used on a commercial scale.

T. A.