

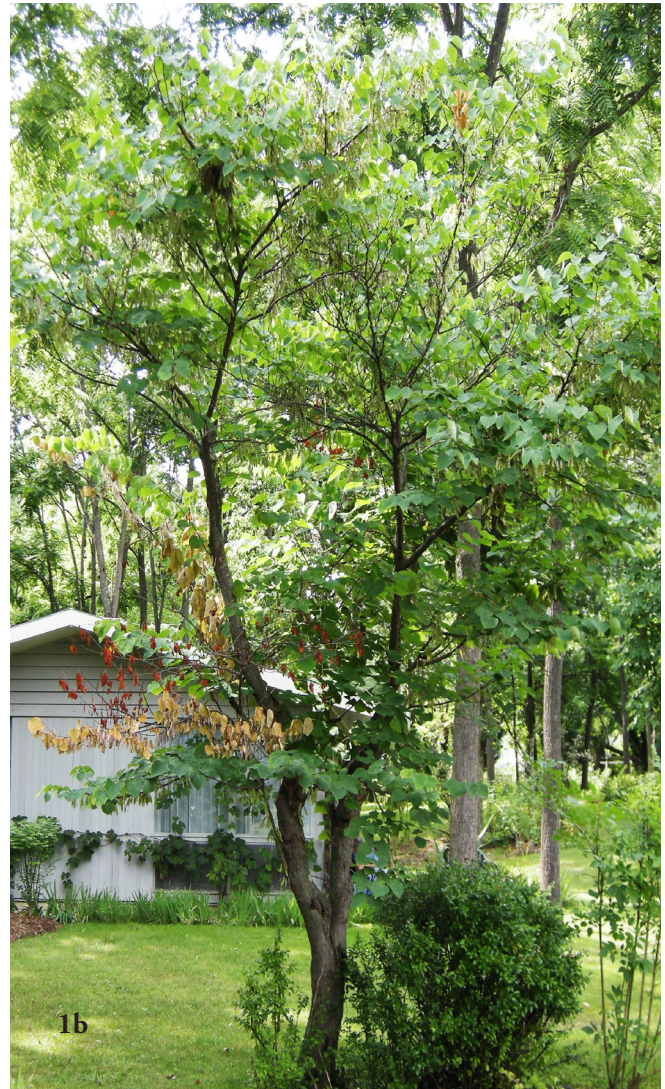
# Botryosphaeria Canker and Dieback of Trees and Shrubs in the Landscape

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Most trees and shrubs are susceptible to dieback and cankers caused by several species of the fungal genus *Botryosphaeria*. *Botryosphaeria* fungi are typically opportunistic pathogens. Opportunistic pathogens only cause disease on plants that are stressed. Therefore, avoiding plant stress, which predisposes plant tissue to infection and colonization by this fungal group, is the best strategy to prevent *Botryosphaeria* disease problems.

## Symptoms

Symptoms of *Botryosphaeria* cankers and dieback are most commonly seen as wilting or dieback of a branch or branches on a tree or shrub that, in other respects, appears healthy (figs. 1a, 1b). Cankered twigs and branches may not be noticeable until wilt and dieback occur. However, if bark is removed, the wood



Figures 1a and 1b. Symptoms of *Botryosphaeria* dieback on rhododendron and redbud. (Photos by E. A. Bush and M. A. Hansen, respectively)



Figure 2. A wilting rhododendron branch with the bark partially removed to reveal the brown discoloration in the wood caused by *Botryosphaeria* species. (Photo by E. A. Bush)

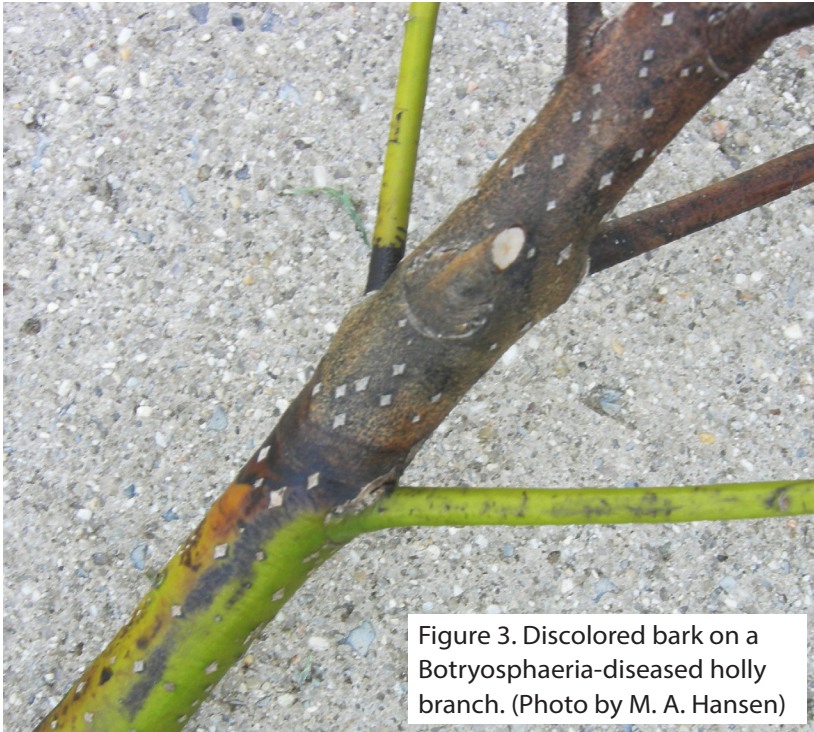


Figure 3. Discolored bark on a *Botryosphaeria*-diseased holly branch. (Photo by M. A. Hansen)

beneath the bark will be discolored brown to reddish-brown instead of white (fig. 2). In some cases, cankers may appear sunken and/or darkened (fig. 3) or be surrounded and contained by callused wound wood, particularly on larger branches or trunks. In other cases, bark may peel and drop from cankered areas (fig. 4).

Cankered areas on tender stems of smooth-barked species, such as crab apple, may appear blistered (fig. 5). On gum-producing trees, such as sweetgum and *Prunus* species, gum may exude from cankered areas (fig. 6). Because of this symptom, *Botryosphaeria* canker and dieback on peach is called “gummosis.” Black fungal spore-producing structures (pycnidia) are sometimes present on diseased tissue and can be observed erupting through the bark. These fruiting bodies are white inside when sliced open (fig. 7).



Figure 4. Peeling bark on a *Botryosphaeria*-diseased apple branch. (Photo by E. A. Bush)

## Disease Cycle

*Botryosphaeria* fungi overwinter as fruiting bodies on dead tissue. They can also survive as endophytes on bark or evergreen leaves. (Endophytes do not cause disease, but live in a beneficial or nondetrimental manner on plant tissue.) Unlike most plant pathogens, *Botryosphaeria* fungi are not host-specific but can cause disease on many plant species. Individual isolates of this fungal group have been reported to differ in aggressiveness, with some being weak pathogens.

*Botryosphaeria* fungi colonize plant tissue through wounds, growth cracks, leaf scars,



Figure 5. A *Botryosphaeria* canker (discolored tissue) on a smooth-barked bloodtwig dogwood. (Photo by E. A. Bush)



Figure 6. Gum exudation (gummosis) on a *Botryosphaeria*-diseased peach branch. (Photo by M.A. Hansen)



Figure 7. A magnified view of black fruiting bodies (pycnidia) [arrow] of *Botryosphaeria* species erupting through the bark of a *Botryosphaeria*-diseased photinia branch. The fruiting bodies are white inside when sliced open (circular inset). (Photo by E. A. Bush)

## Host Range

Hundreds of plant genera, including both angiosperms (flowering plants) and conifers, are susceptible to *Botryosphaeria* cankers and dieback. The following list includes some common landscape trees and shrubs that are reported hosts of *Botryosphaeria* species. Plants with an asterisk represent plant samples that have been diagnosed with *Botryosphaeria* disease in the Virginia Tech Plant Disease Clinic since electronic records have been kept (1999).

apple*	fig*	<i>Pittosporum</i> species
arborvitae*	fir*	poplar*
ash*	forsythia*	privet*
aucuba*	giant sequoia*	<i>Prunus</i> species
azalea*	hickory	<i>Pyracantha</i> species
barberry*	holly*	<i>Robinia</i> species
bayberry*	honey locust*	redbud*
beech	honeysuckle*	rhododendron*
birch*	hypericum*	rose*
black gum*	Japanese pagodatree*	serviceberry*
buckeye	juniper	spirea*
camellia*	<i>Laurus</i> species*	spruce*
cherry*	Leyland cypress*	sumac*
cherrylaurel*	lilac*	sweet gum*
chokecherry*	linden*	sycamore
cotoneaster*	magnolia*	tulip tree
crab apple*	maple*	viburnum*
crapemyrtle	mountain laurel*	walnut*
cryptomeria*	oak*	wax myrtle*
cypress*	pear*	willow*
dogwood*	pecan*	wisteria*
douglasfir*	persimmon*	witch hazel*
eastern red cedar*	<i>Photinia</i> species*	yew*
elm*	<i>Pieris</i> species*	zelnkova*
<i>Euonymus</i> species*	pine*	
falsecypress		

and lenticels (pores on stems, branches, and trunks that allow gas exchange). On rhododendron, *Botryosphaeria* spp. have been shown to initiate infections on the stem of the floral inflorescence and colonize tissue progressively downward, causing branch dieback. Similarly, *Botryosphaeria* fungi may initially colonize dead branch tissue and move downward on the branch into healthy bark and sapwood. Spread of these fungi occurs through air movement or splash dispersal of spores, and can also occur through use of contaminated pruning tools.

## Controlling and Avoiding Botryosphaeria Disease

There are no effective fungicide controls for *Botryosphaeria* dieback. The best defense against this commonly occurring disease is to ensure plants are in optimal health by providing the appropriate cultural requirements for the particular plant species, avoiding plant stress and injury, and employing appropriate sanitation measures.

It is important to remember that under optimal growing conditions, trees and shrubs are typically able to resist infection and colonization by *Botryosphaeria* fungi. The remainder of this fact sheet outlines specific tactics homeowners can use to avoid infection by these opportunistic fungal pathogens on landscape shrubs and trees.

## Plant Selection

Proper plant selection and placement in the landscape are the first steps toward vigorous, healthy landscape plants that are able to resist attack by *Botryosphaeria* fungi. Growers should carefully inspect potential plant purchases for signs of stress or pest problems and avoid purchasing plants that are infested with pests or show evidence of stress or injury (e.g., severely pot-bound container plants; wounded branches, stems, or trunks; wilted or browning leaves). Growers should also avoid purchasing plants that exhibit signs of plant neglect (e.g., inadequate or excessive irrigation, poor sanitation, overcrowded or toppled container plants).

Growers should select plants with an appropriate hardiness zone rating for their region. Plants that are planted outside their recommended hardiness range will not thrive and are likely candidates for *Botryosphaeria* attack. Also, trees and shrubs should be placed in landscape locations appropriate for the particular plant species.

Different plant species have preferences and/or tolerances for certain cultural conditions (e.g., sun versus

shade, moist versus dry soil conditions, protected versus exposed locations, etc.). For example, redbud and sweetgum trees located in shade have been reported to experience more numerous and more severe *Botryosphaeria* cankers and dieback compared to those located in full sun. Conversely, rhododendron planted in full sun is more susceptible to *Botryosphaeria* disease than rhododendron in part shade.

Cultural preferences and hardiness ratings are typically listed on the plant tag, but there are many other sources of information on plant cultural requirements, including local Virginia Cooperative Extension agents ([www.ext.vt.edu/offices/](http://www.ext.vt.edu/offices/)), knowledgeable staff at nurseries, and online and other horticultural references. Time taken to carefully examine potential plant purchases and ensure proper cultural conditions will go a long way toward avoiding *Botryosphaeria* dieback and cankers.

## Environmental Stress

Many environmental stress factors, such as heat, drought, freeze injury, and compacted soil, can predispose trees and shrubs to infection and colonization by *Botryosphaeria* fungi. Some environmental stress factors are unavoidable, but many can be avoided. Providing irrigation to trees and shrubs during dry periods is recommended. Likewise, susceptible trees and shrubs should be protected from a sudden and significant drop in temperature when possible. Growers should avoid planting locations that are compacted by construction or foot traffic and soils that are excessively wet or suffer from poor drainage. If these conditions are present, they should be corrected before planting.

## Cultural Practices

Poor cultural practices can also predispose plants to infection by *Botryosphaeria* spp. Some cultural problems commonly observed include: plant tissue injury during pruning and other activities, excessive mulch application, plants set at an improper soil depth, failure to irrigate plants during establishment, improper soil pH, and inadequate sanitation practices.

Wounded plant tissue is susceptible to infection by *Botryosphaeria* fungi. Growers should practice proper pruning techniques in order to avoid large pruning wounds. When working in the landscape, avoid injury to trees or shrubs through careless use of equipment, such as lawn mowers or trimmers. Also, handle plants carefully during planting to avoid injury to roots, trunks,

stems, and branches of trees and shrubs. Monitor plants carefully for signs or symptoms of insects, voles, and other pests that can injure plant tissue and predispose tissue to infection by *Botryosphaeria* spp.

Proper nutrient availability is necessary for vigorous, healthy trees and shrubs. However, growers should avoid fertilizing woody shrubs and trees unless a soil test report or tissue analysis indicates a need for supplemental nutrients. Excessive fertilization encourages succulent tissue that is prone to pest problems. Additionally, most nutrient problems on landscape plants are not caused by inadequate soil nutrients, but by improper soil pH. A local Virginia Cooperative Extension agent can assist homeowners in obtaining a soil test to check soil pH and determine if a fertilizer application is recommended. The soil test report will include information on adjusting soil pH to the optimal range for individual tree and shrub species if a pH problem is identified.

Sanitation measures are also important in reducing the risk of *Botryosphaeria* disease and spread. Pruning out dead wood is very important, because *Botryosphaeria* spp. colonize dead wood and can move from dead to healthy wood. Prune dead wood back to an area on the branch that is healthy (white to cream-colored when cut). Disinfecting pruning tools with rubbing alcohol between cuts may prevent the spread of *Botryosphaeria* inoculum on pruning tools.

## References

- Dirr, M.A. 1990. *Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses*, 4<sup>th</sup> ed. Champaign, Ill.: Stipes Publishing Co.
- Coyier, D.L., and M.K. Roane. 1986. *Compendium of Rhododendron and Azalea Diseases*. St. Paul, Minn.: APS Press.
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**Table 1. How to avoid some common plant problems that may predispose plants to attack by opportunistic fungi, such as *Botryosphaeria* spp.**

When transplanting:

- Set woody shrubs and trees at the proper planting depth. The structural root nearest the soil line should be placed no deeper than 1 inch to 3 inches below the soil surface, measured 4 inches out from the trunk. (Structural roots are the large, woody roots that support the tree/shrub.) Note that structural roots are sometimes placed too deeply when potted or planted at the nursery. If this is the case, remove excess soil or potting medium so that plants can be set correctly in the landscape.
- Avoid purchasing severely pot-bound container plants. If circling roots are evident when the container is removed, try to tease the circling roots out to encourage growth of roots out of the root ball into the surrounding soil. Carefully cut away any circling roots at the top of the root ball that might eventually enlarge, girdle the stem and threaten the long-term health of the plant.
- Water adequately during establishment. (If rainfall is below 1 inch per week, provide enough water to bring the total to 1 inch.) Keep in mind that newly planted trees and shrubs require frequent irrigation during dry periods, because their root balls will dry out before the surrounding soil does. Less frequent, deeper irrigation is preferable to more frequent, shallow irrigation, because this will encourage root systems to grow deeper into the soil profile.
- Place mulch no more than 2 inches deep over the root zone of trees and shrubs. The mulch should not contact the bark of woody plants (i.e., place in a donut-shaped ring around the stem or trunk). Deep mulch and mulch in contact with bark reduces soil aeration and makes plants vulnerable to colonization by wood-decay organisms.
- Avoid damage to roots, stems and branches

during and after planting. Wounds create entry points for wood-decay organisms. Damage to woody plants often results from lawn mowers and trimming equipment.

Pruning:

- Practice proper pruning techniques to avoid creating wounds that can serve as entry points for *Botryosphaeria* spp. Refer to the following Virginia Cooperative Extension publications:
  - A Guide to Successful Pruning: Pruning Deciduous Trees, VCE publication 430-456; <http://pubs.ext.vt.edu/430/430-456/430-456.html>.
  - A Guide to Successful Pruning: Pruning Evergreen Trees, VCE publication 430-457; <http://pubs.ext.vt.edu/430/430-457/430-457.html>.
  - A Guide to Successful Pruning: Pruning Shrubs, VCE publication 430-459; <http://pubs.ext.vt.edu/430/430-459/430-459.html>.
- Pruning at the wrong time of year can predispose woody plants to infection by *Botryosphaeria* fungi. Recommended pruning times vary for different plant species. Refer to the following pruning calendars:
  - A Guide to Successful Pruning: Deciduous Tree Pruning Calendar, VCE publication 430-460; <http://pubs.ext.vt.edu/430/430-460/430-460.html>.
  - A Guide to Successful Pruning: Evergreen Tree Pruning Calendar, VCE publication 430-461; <http://pubs.ext.vt.edu/430/430-461/430-461.html>.
  - A Guide to Successful Pruning: Shrub Pruning Calendar, VCE publication 430-462; <http://pubs.ext.vt.edu/430/430-462/430-462.html>.