



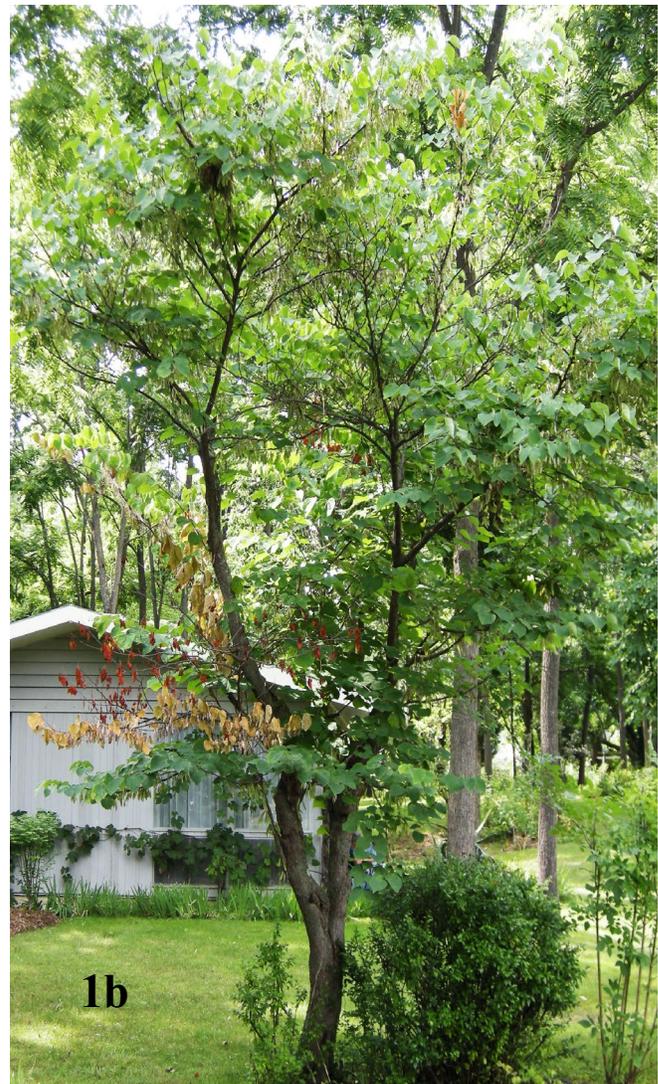
Botryosphaeria Canker and Dieback of Trees and Shrubs in the Landscape

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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 beneath the bark will be discolored brown to reddish-brown instead of white (fig. 2a). The discoloration in the wood may also be observed in a cross-section of a branch or main stem (fig. 2b). 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).



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



Figure 2a. 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, Virginia Tech)



Figure 2b. A cross-section of a viburnum branch reveals internal discoloration to woody tissue caused by *Botryosphaeria*. (Photo by E. A. Bush, Virginia Tech)



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

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).

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, 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 flower 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.



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



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



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



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, Virginia Tech)

Avoiding and Managing 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/), knowledgeable staff at nurseries and horticultural publications. 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 compacted by construction or foot traffic and soils that are excessively wet or drain poorly. 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 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 (<https://ext.vt.edu/offices.html>) 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 a healthy area on the branch (white to cream-colored inside when cut). Disinfecting pruning tools with rubbing alcohol between cuts may prevent the spread of *Botryosphaeria* inoculum on pruning tools.

Diagnosing the Disease

Branch or main stem/trunk samples that include the junction of healthy (white) and diseased (brown to reddish-brown) tissue are needed for diagnosis of *Botryosphaeria* dieback and canker (Fig. 2a). Cankered areas on branches may not be apparent until bark is removed and it may take some time to find such a junction. Do not remove all the bark when you locate a junction of healthy and diseased tissue, since it is best for diagnostic purposes to keep bark intact. Another option is to cut cross-sections through branches to locate cankered areas and a junction of healthy and diseased tissue (Fig. 2b). Completely dead or healthy branches are not useful for diagnosing *Botryosphaeria* dieback, so take time to find appropriate branch samples.

The Virginia Tech Plant Disease Clinic can diagnose this disease and other plant diseases. Refer to the Plant Disease Clinic website (<https://bit.ly/VTplantclinic>) for the current diagnostic form, fees, and instructions on collecting an appropriate diagnostic sample and submitting samples to the Plant Disease Clinic.

References

- Dirr, M.A. 1990. *Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses*, 6th 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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Scan for more information about the Virginia Tech Plant Disease Clinic



<https://bit.ly/VTplantclinic>

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 ornamental 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).

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

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. It is best to apply the irrigation directly to the container rootball to fully saturate the rootball during establishment. 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 opportunistic fungi. 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>.
- 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>.

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