

Disease Update: Boxwood Blight in Georgia

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Boxwood Blight, caused by the fungus, *Calonectria pseudonaviculatum* (syn. *Cylindrocladium pseudonaviculatum* and *Cylindrocladium buxicola*) has been confirmed in multiple commercial and residential landscapes in GA. The disease could be found throughout the state; however, most of the confirmed detections have been within metro-Atlanta and the surrounding counties where boxwoods are common in formal gardens. Boxwood blight also has been detected on plants brought into GA for resale. Often the source of the introductions is unknown. In some cases new boxwood plants were recently planted. In others, it may be from pruning or other garden maintenance operations. The spores of the pathogen are very sticky and they can stick to worker's tools, clothing, or even animal fur (cats, dogs, rabbits, etc.) that may move through the garden. Once introduced, the disease can be devastating to boxwood in landscapes and nurseries.



Boxwood blight infected dwarf English boxwood in GA showing tan foliage and dieback. (Image by Jean Williams-Woodward)

Hosts: Dwarf English boxwood (*Buxus sempervirens* 'Suffruticosa') is highly susceptible and develops severe symptoms and rapid leaf drop. American or common boxwood (*B. sempervirens*) cultivars are also very susceptible. Cultivars of Littleleaf (Japanese) and Korean boxwood (*B. microphylla* and *B. sinica*, respectively) appear less susceptible because they don't show severe symptoms and leaf drop, but they are still susceptible. None of the commercial boxwood cultivars are immune to this disease. In fact, lesser susceptible (e.g. tolerant) cultivars may act as a 'Trojan Horse' introducing the disease into landscapes containing more susceptible cultivars. The value of lesser susceptible cultivars is in the establishment of new boxwood hedges. If planting a new area, use a more tolerant cultivar to lessen your disease pressure in subsequent years. The disease also affects other plants within the Buxaceae family, including *Pachysandra terminalis* (ground spurge) and *Sarcococca* sp. (sweet box).

History: Boxwood blight was first identified in the USA in the fall of 2011 in NC and CT. Since then, it has been identified within nurseries and/or landscapes in numerous states (AL, CT, DE, FL, GA, KS, KY, MA, MD, MO, NC, NJ, NY, OH, OR, PA, RI, TN, VA, WV) and several Canadian provinces. The disease is spreading to new states each year (FL and WV were added to the list in 2015). Spread is most likely through the movement of infected plants. The disease has been known for over decade in the UK and Europe.

Symptoms: Initial symptoms of boxwood blight include circular, tan leaf spots with a dark purple or brown border. Leaf spots may or may not have yellow to reddish halos surrounding the spot. Black stem lesions or blackening of the stems is often seen. This can be confused with black lesions due to *Colletotrichum* stem canker, a relatively new disease also affecting boxwood stems. Boxwood blight

Infected leaves become tan and readily drop from the plant leaving bare stems. Rapid defoliation is a characteristic symptom of boxwood blight that separates it from other boxwood diseases. Sections or whole plants turn tan and eventually die. The disease can resemble Volutella blight, except that with Volutella blight, as well as with symptoms of root stress or Phytophthora root disease, the leaves often remain attached to the stems. Box blight can move quickly through infected plants, gardens, and nurseries under favorable environmental conditions.



Boxwood blight symptoms clockwise from upper left: Tan to gray leaf lesions with a darker purplish border on an English boxwood; Circular, tan spots with a brown border on upper leaves; Tan blighted leaves and bare stems on an infected plant; blackening of stems and browning foliage; and black stem lesions on bare branch tips. (Images by Jean Williams-Woodward)

Disease Cycle: Low light (shade), humid, warmer and wet conditions favor disease development. The pathogen requires extended periods of leaf wetness (24-48 hrs) to infect. Under these conditions, leaf spots can develop within days of infection. Disease is favored by moderate temperatures of 41-86°F, with an optimal temperature of 77°F. The fungus is sensitive to high temperatures and can be killed after 7 days at 91°F. This does not mean that the fungus can't survive hot GA summers. The fungus produces structures (called microsclerotia) that allow the fungus to survive adverse conditions. Once favorable conditions and a host are present, the disease will develop again. In GA, the disease is likely most active during the late summer, fall, winter and spring months. Disease development may be slowed under relatively dry, hot conditions or where fungicides are used.

Spread: The disease is primarily spread via infected plants and plant debris. Infected leaves drop and can contaminate the soil beneath the plant. Infected leaves may also be carried by water, wind, on shoes or tires, or on animal fur as they rub against infected plants. The fungus produces white tufts of clustered spores on the underside of infected leaves and on stems under wet conditions. The spores are very sticky and they will stick to pruning tools, shovels, worker's clothing and hands, as well as fur and feathers of wild and domestic animals (dogs, cats, rabbits, wild turkeys, etc.). Although it is very easy to spread this disease, the spores are not wind-borne. They must be moved on plants, on tools, etc. or by splashing of irrigation or rain water.



White tufts of conidiophores and spores of boxwood blight produced from black stem lesions. The darker tufts are plant trichomes. (Image by Ansuya jogi)

Management: The best control is exclusion. Do not introduce the disease on infected plants or tools. Inspect all new boxwood plants for symptoms of the disease. Be sure to check the lower leaf canopy and interior stems. Keep new plants isolated and separate from existing boxwoods. Do not apply fungicides to plants in isolation that would mask symptom development. Monitor plants for at least four weeks prior to introducing them into existing plantings.

If Boxwood blight is detected, the infected plants and all fallen leaf debris needs to be bagged on-site and removed from the area to be buried in a landfill to prevent its spread. Transport plants in closed bags. Leaf litter blowing from open trucks could spread the disease to plantings along the roadway. Fallen leaf debris should be vacuumed and bagged, burned on-site or buried. Debris should not be composted. The fungus also produces microsclerotia (small clump of fungal hyphae) within roots and leaf debris of infected plants that allows the fungus to survive for years. Removal of existing garden soil and replacing with new soil is an option, but there is no guarantee that this will completely remove the pathogen.



Fallen leaf litter beneath boxwood blight infected plants. Debris must be removed or buried to reduce disease spread. (Image by Jean Williams-Woodward)

Boxwood blight cannot be controlled with curative fungicide applications. Fungicides are only effective when applied preventively. Fungicide efficacy trials have shown that fungicides containing chlorothalonil (Daconil, Spectro, Concert II) and fludioxonil (Medallion, Palladium) provided the best control when applied preventively. To a lesser extent, fungicides containing azoxystrobin (Heritage), metaconazole (Tourney), pyraclostrobin (Pageant), tebuconazole (Torque), thiophanate methyl (Cleary's 3336, OHP 6672), trifloxystrobin (Compass), provided fair to good preventative control. Most are not labeled for use on either boxwood, *Calonectria* (or *Cylindrocladium*) or both; however, this is changing, so check labels. Remember, spraying plants after the disease is present will NOT control this disease.

Summary: Boxwood blight is an extremely contagious disease of boxwood and pachysandra. It was first detected in GA in an established landscape where new plant introductions have not occurred. It is likely that the disease is present in other locations and may be mistaken for more common diseases such as Volutella blight and root disease. Landscapers and growers need to be vigilant in scouting for disease symptoms and take all precautions to avoid introducing the disease into nurseries and properties.

Recommendations for Landscapers:

- Inspect boxwoods on all properties. Look for symptomatic plants. As weather patterns become conducive (wet, humid, warm), disease symptoms may become noticeable and spread rapidly.
- Submit suspect samples to the UGA Plant Disease Clinic in Athens through county extension offices for disease identification.
- Train employees and clients on how to identify boxwood blight. Educate them on how easily the disease spreads.
- Only purchase plants from nurseries that have a Boxwood Blight Compliance Agreement through their State Department of Agriculture. Many plants are brokered, so ask where plants were grown. Keep new plants in isolation and monitor for symptoms prior to installation.
- Never install or prune or work in boxwoods when plants are wet.
- Always visit non-infected landscape sites first. Move healthy to suspect diseased areas; never the other way around.
- Disinfect pruners and other tools frequently within and between different blocks of plants within the same landscape, and especially when moving to different landscapes.
 - The best product is Lysol Concentrate Disinfectant (containing 5.5% O-benzyl-p-chlorophenol). Mix 2.5 Tbsp per gallon of water. This can be made and kept in spray bottles. Tools need to be wet for at least 10 seconds and allowed to dry to be effective.
 - A 10% bleach solution (1:9 part Clorox or 1:14 part Clorox Concentrate) for at least a 10 second soak can also be used, but this will oxidize tools. Soak and then let dry.
- When leaving a site suspected or known to have boxwood blight, all tools, shoes, and clothing must be disinfected.
- Get in the habit of wearing clean disposable booties or washing off debris and dirt entirely from soles of shoes between landscapes.
- Changing and laundering clothes between sites would be ideal; however, it's impractical. Wearing disposable paper pants is an option.

Recommendations for Nurseries:

- Follow the same recommendations as for landscapers.
- Start with disease-free propagation stock. If you only propagate in-house, continue this practice. If purchasing propagative material, only purchase from GA nurseries, which are not known to have the disease. If purchasing from out-of-state, only purchase from nurseries with a state Boxwood Blight Compliance Agreement.
 - Contact the Georgia Department of Agriculture to obtain a Compliance Agreement for shipment of Boxwood blight hosts for your nursery.
- Keep new plant introductions in an isolated holding area on a surface that can be easily cleaned of fallen plant debris. Debris should be vacuumed or swept regularly. Avoid blowing debris. Plants should be held for at least four weeks to monitor for symptom development.
- Avoid co-mingling plant material from different sources.
- Follow good sanitation practices. Clean debris and disinfect tools between blocks.
- Do not accept boxwood plant returns onto the nursery.
- Trucks, racks, carts and other equipment should be disinfested regularly (use Lysol Concentrate Disinfectant). All plant debris should be cleaned from the area.
- Avoid overhead watering and do not work in blocks when plants are wet.
- Train all employees on boxwood blight symptoms. Scout plants regularly. Submit any suspect plants to the UGA Plant Disease Clinic in Athens for identification.

- Remove suspect plants from blocks to reduce possible disease spread. Keep in isolation or discard by burning on-site or bagging and burying. Do not put infected plants into a cull pile.
- Establish a preventive fungicide spray program to reduce disease development. Keep records of all chemical applications, rates, and dates of application.
- Keep detailed records of incoming and out-going boxwoods and where plants have moved within the nursery.
- Don't forget to inspect any boxwoods planted on the grounds of the nursery. These too could become infected.

Useful sites and links:

North Carolina cultivar evaluations, fungicide efficacy, management guidelines:

<http://plantpathology.ces.ncsu.edu/pp-ornamentals/>

<http://plantpathology.ces.ncsu.edu/wp-content/uploads/2013/05/Box-blight-Guide-07.22.13.pdf>

<http://www.ces.ncsu.edu/wp-content/uploads/2013/05/final-Cult-trials-summary-2013.pdf>

University of Connecticut Boxwood Blight information and fact sheets:

<http://www.ct.gov/caes/cwp/view.asp?a=3756&q=500388>