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Calonectria blight of containerized nandina nursery stock

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Introduction

Calonectria diseases cause significant economic losses in the ornamental horticultural industry worldwide (Aiello et al. 2022). In 2024 and 2025, *Calonectria* spp. were isolated from leaf spots, stem cankers, stem dieback, and necrotic roots of containerized *Nandina domestica* (nandina/heavenly bamboo) nursery stock from 11 nurseries in 11 Virginia counties. The fungus was confirmed in 7 *N. domestica* cultivars: Blush Pink, Fire Power, Gulf Stream, Harbour Dwarf, Lemon Lime, Moon Bay, and Obsession.

Symptoms

Calonectria spp. cause leaf spots, defoliation, stem cankers, and stem dieback of containerized nandina nursery stock, mostly in the inner and lower portions of the plant canopy (Fig. 1). Leaf spots begin as dark brown, circular to blotchy lesions sometimes with a yellow or red halo (Fig. 2). Affected leaves tend to fall off and fill the container. Stem cankers begin as small, black, slightly sunken lesions, often speckled along the stem and collar, but can also encircle the diameter of small stems and develop a red halo (Fig. 3). The fungus also causes stems and panicles to die back (Fig. 4). In a few nurseries, extensive blight symptoms were observed on sapling plants propagated in plugs (Fig. 5). The pathogen has been isolated infrequently from symptomatic roots, however, its role as a root rot pathogen on nandina is unclear. This disease may look like a variety of other diseases and pathogens, including *Colletotrichum* and *Fusarium* species, which were often isolated from plants infected with *Calonectria*.

Fig. 1 - Containerized *Nandina* 'Lemon Lime' nursery stock with lower crown defoliation and significant dieback. Infected leaves of *Nandina* 'Gulf Stream' that have fallen in the pot.

Fig. 2 - Dark brown leaf spots with a red halo and white sporulation fruiting from underneath the leaf.

Fig. 3 - Large stem cankers on *Nandina* ‘Moon Bay’ and ‘Lemon Lime’ with a red halo.

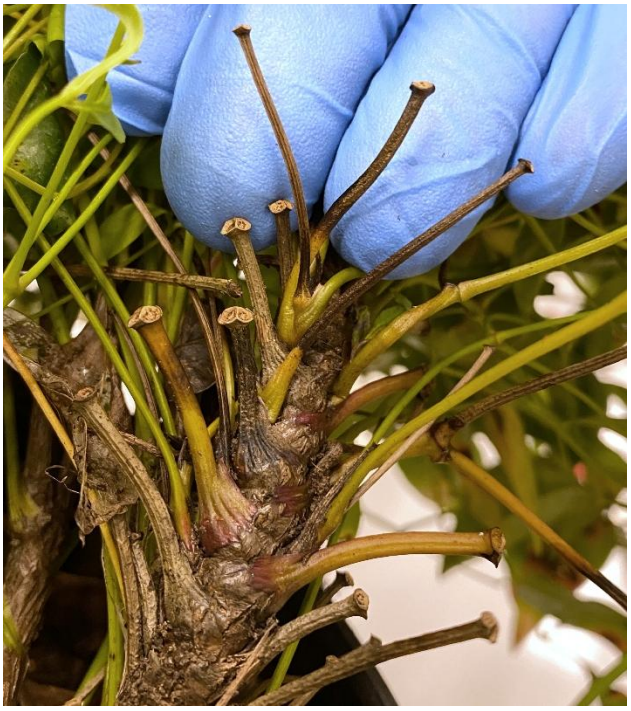

Fig. 4 - Stem dieback on *Nandina* ‘Obsession’.

Fig. 5 - A *Nandina* ‘Lemon Lime’ sapling propagated in a plug with severe crown dieback.

Disease Cycle

There is limited research on the disease cycle of Calonectria blight on nandina; however, all diseases caused by Calonectria fungi are polycyclic, meaning they have repeated infection cycles within one crop season (Aiello et al. 2022). The pathogen may overwinter in blighted plant tissues. It also may overwinter in soil and plant debris as resting structures called microsclerotia, which allow the fungus to survive for years until the presence of a host, moisture, and warm conditions initiate germination (Aiello et al. 2022).

Overwintered microsclerotia germinate to produce spores, which initiate primary infection, and this usually occurs in the seedling or propagation stage from infested potting media. Liners purchased by a wholesale nursery can already be infected at the propagation nursery, even if symptoms are not present.

Secondary infection occurs during production with inoculum, i.e., spores borne from infected plant parts or plant debris. This infection could be extensive during warm, humid conditions. The spores are sticky and are dispersed by water splashing, contaminated equipment and tools, and infected plant debris (Aiello et al. 2022).

Control Options

Cultural Control

Preventing the fungus from entering the production system is critical to successfully managing all Calonectria diseases. Ideally, propagate stock from seed or tissue culture, as cuttings can harbor inoculum. This also includes not reusing potting media, as this is a common pathway of introducing disease into healthy plant stock. Use non-infested or sterilized planting media that is suitable for nandina, which prefers well-drained soil with a pH of 3.7 to 6.4 (Niemiera 2024). Soilless premixes of peat, perlite, and vermiculite are readily available and generally low in weed-seed contaminants and harmful microorganisms, making them an excellent choice for seedling propagation. Composted pine bark is a good growing substrate for containerized nandina production. It is readily available in Virginia, can be screened to a variety of particle sizes, is generally disease-free, and has a pH of 3.8 to 4.5 (Kaderabek et al. 2017). If reusing containers, remove all residual dirt and debris then disinfest by soaking in a 10% bleach solution for at least 10 minutes.

To reduce the spread of secondary inoculum:

- Remove all fallen plant debris in production areas, especially leaves that reside in containers. Do not use a leaf blower to remove the debris, as this may disperse spores.
- After soil and debris has been removed from tools, floors, and bench tops, a sanitizer can be sprayed to kill inoculum. Table 1 lists effective sanitizers for Calonectria pathogens.
- To reduce water splashing into the crown of plants, use drip irrigation instead of a sprinkler. If a sprinkler is used, irrigate during morning hours to reduce periods of leaf wetness.
- A ½-inch layer of parboiled rice hulls can be used to cover the top portion of the root ball to reduce spores from splashing up into the crown.
- Space containers 6 inches apart to increase air circulation and reduce pathogen dispersal between plants from splashing.
- A fan at low speed can be used in hoop houses to increase airflow, reduce leaf wetness, and dry standing water.
- Make sure the foliage is dry before pruning stock, disinfect the tool with a sanitizer product between plants, and remove pruned foliage afterwards.

Table 1. Sanitizers recommended for Calonectria diseases in nurseries[1]

Active ingredient	Example of brand name[2]	Concentration[3]	Contact time/application
ethanol	Sanihol ST	70% or greater for clean non-porous surfaces and tools.	Apply to the surface and allow to air-dry. At least 10 sec. to sanitize tools, 10 min. to disinfect.
sodium hypochlorite (5.25% or 8.25%)	Clorox	12.8 oz/gal. of 5.25% bleach. 9.1 oz/gal. of 8.25% bleach. Must be prepared fresh.	5–10 min. for clean surfaces. At least 10 sec to sanitize tools (will corrode metal).
hydrogen dioxide	Zerotol	0.85 oz/gal. for clean non-porous surfaces and tools. 2.5 oz/gal. for unclean non-porous surfaces and tools.	1–10 min. to disinfect surfaces and tools.
hydrogen peroxide, peroxyacetic acid, and octanoic acid	Xeroton 3	0.09 oz/gal. for clean non-porous surfaces and tools. 0.5 oz/gal. for unclean non-porous surfaces and tools.	10 min. to disinfect surfaces. At least 10 sec. to sanitize tools, 10 min. to disinfect.
phenolic compounds (O-benzyl-p-chlorophenol)	Lysol Concentrate Disinfectant	1 oz/gal. for clean non-porous surfaces. 2 oz/gal. for unclean non-porous surfaces and tools.	10 min. to disinfect surfaces. At least 10 sec. to sanitize tools, 10 min. to disinfect.
octyl decyl dimethyl + dioctyl dimethyl + didecyl dimethyl + dimethyl benzyl ammonium chloride	Simple Green D Pro 5	2 oz/gal. for clean non-porous surfaces. 8 oz/gal. for unclean non-porous surfaces and tools.	10 min. to disinfect surfaces. At least 10 sec. to sanitize tools, 10 min. to disinfect.
2-propanol + didecyl dimethyl ammonium chloride	KleenGrow	1 oz/gal. for clean non-porous surfaces and use on tools.	10 min. to disinfect surfaces. At least 10 sec. to sanitize tools, 10 min. to disinfect.
dimethyl benzyl + dimethyl ethylbenzyl ammonium chloride	GreenShield	0.3 oz/gal. for clean non-porous surfaces. 0.6 oz/gal. for unclean non-porous surfaces and tools.	10 min. to disinfect surfaces. At least 10 sec. to sanitize tools, 10 min. to disinfect.
potassium peroxymonosulfate + sodium chloride	Virkon S	1.3 oz/gal. for clean, porous, and non-porous surfaces. 2.6 oz/gal. for unclean, porous, and non-porous surfaces and tools.	10 min. to disinfect surfaces. At least 10 sec. to sanitize tools, 10 min. to disinfect.

[1]: Sources of efficacy information: Virginia Cooperative Extension Boxwood Blight Task Force, https://ext.vt.edu/agriculture/commercial-horticulture/boxwood-blight.html; LaMondia, J.A., Cowles, R.S., Shishkoff, N. 2025. The Effects of Sanitizers on Calonectria pseudonaviculata and C. henricotiae Conidia and Microsclerotia Viability. Jour. of Enviro. Hort. 43: 83-90; Bika, R., Copes, W., and Baysal-Gurel, F. 2021. Comparative Performance of Sanitizers in Managing Plant-to-Plant Transfer and Postharvest Infection of Calonectria pseudonaviculata and Pseudonectria foliicola on Boxwood. Plant Disease 105: 2809-2821.

[2]: Always follow the manufacturer's instructions.

[3]: Lethal concentrations for fungal spores only, not microsclerotia in plant debris. Therefore, it is very important to wash off surface soil and/or debris before proceeding with any sanitizing procedure.

Chemical Control

A variety of fungicides have been demonstrated to be effective against other Calonectria diseases (Table 2). Systemic fungicides are absorbed into the plant and moved internally for lasting protection. Contact fungicides stay on the surface for preventive, short-term defense. Always follow manufacturer's instructions, apply fungicides before symptoms appear, and if using a contact fungicide, target the lower and inner crown of plants.

It is important to rotate FRAC code fungicides with different modes of action to minimize the risk of pathogen resistance development. Specifically, rotating applications of boscalid + pyraclostrobin and cyprodinil + fludioxonil are highly effective in reducing leaf and stem infections caused by *Calonectria* fungi (Cinquerrui et al. 2016).

Biological Control

Agents such as *Bacillus*, *Trichoderma*, or *Streptomyces* have been combined with fungicides to improve protection, although, when used independently, were not effective in controlling disease (Cinquerrui et al. 2016).

Table 2. Fungicides recommended for control of Calonectria diseases in nurseries[1]

Active Ingredient[2]	Trade Name	FRAC Group[3]	Application Mode
boscalid + pyraclostrobin	Pristine, Signum	7+11	systemic
chlorothalonil	Daconil, Bravo	M5	contact
chlorothalonil + thiophanate methyl	Spectro 90WDG	M5+1	contact + systemic
cyprodinil + fludioxonil	Alterity, Switch	9+12	systemic + contact
fludioxonil	Medallion, Scholar	12	contact
fluopyram	Luna Privilege	7	systemic
mancozeb	Dithane, Fore 80 WP Rainshield	M3	contact
myclobutanil	Eagle 20EW, Rally 40 WSP	3	systemic
propiconazole	Banner MAXX, Procon-Z	3	systemic
propiconazole + chlorothalonil	Concert, Concert II	3+M5	systemic + contact

[1]: Results can vary depending on environmental conditions, formulation of a fungicide, and application method and timing. Always follow the manufacturer's instructions. These ratings are intended as general guides only.

[2]: Sources of efficacy information: Aiello, D., Guarnaccia, V., Vitale, A., LeBlanc, N., Shishkoff, N., and Polizzi, G. 2022. Impact of Calonectria diseases on ornamental horticulture: diagnosis and control strategies. Plant Disease 106: 1773-87; Cinquerrui, A., Polizzi, G., Aiello, D., and Vital, A. 2016. Integrated management for the reduction of Calonectria infections in ornamental nurseries. Plant Disease 101: 165-169; LaMondia, J.A. 2014. Evaluation of fungicides for management of boxwood blight, *Calonectria pseudonaviculata*. Plant Disease 98: 99-102.

[3]: FRAC Group: classification based on fungicide mode of action (www.frac.info). Rotate any fungicide at risk of resistance development with products that have a different FRAC group. FRAC groups that start with M are multi-site contact fungicides and are low risk for resistance development.

References

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Diagnosing This and Other Plant Diseases

The Virginia Tech Plant Disease Clinic can test for this and other plant diseases. The whole plant should be sent as a sample if possible. If the plant is containerized, include fallen leaves and potting media. 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.

https://bit.ly/VTplantclinic

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