



Jean Williams-Woodward
jwoodwar@uga.edu

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Calonectria root, crown, and cutting rots are less common, but just as damaging

Spathiphyllum plants within a greenhouse showed symptoms of wilting and yellowing of the oldest leaves (Figure 1). These are classic symptoms of a root disease.

Roots of young plants also showed dark discoloration mostly at the root tips (Figure 2). Serology tests for *Phytophthora* were negative and microscopic examination of the roots did not reveal spores nor hyphae of the usual root pathogen suspects. When looking at roots of older, wilting plants, the roots were soft, discolored, and covered in white fungal growth of hyphae and spores of the fungus, *Calonectria spathiphylli* (Figure 3).

It is usually assumed that the cause of wilting and dead plants is one of the more common root and crown rot pathogens such as *Phytophthora*, *Pythium*, *Rhizoctonia*, or *Fusarium*. However,



Figure 1: Wilting and chlorosis are symptoms of root disease caused by *Calonectria spathiphylli* on young *Spathiphyllum* plants. Image by Brian Harding

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Figure 2: Chlorotic *Spathiphyllum* plants also had darkly discolored roots mostly at the root tips. Image by Brain Harding.



Figure 3: Roots of older, wilted *Spathiphyllum* were darkly discolored, soft, with white fungal growth of hyphae and spores of *Calonectria spathiphylli*. Image by Brain Harding.

it is best to have the cause of the problem accurately identified because chemical and cultural controls may be different. Misidentification wastes money and time.

Calonectria (formerly called *Cylindrocladium*) infects fewer hosts than the more common root pathogens, but crop loss can be severe when the disease is not managed. See the table (page 4) for a list of herbaceous and woody hosts infected by *Calonectria* spp. in the USA. Many species of *Calonectria* also may only infect a small number of plant species or species within a specific plant family. For example, the most notorious *Calonectria* disease affecting ornamentals currently is Boxwood Blight, caused by *Calonectria pseudonaviculata*. This species infects *Buxus*, *Pachysandra*, and *Sarcococca* spp. causing leaf spots and stem lesions that causes severe defoliation and can kill boxwoods. The most common species in the USA causing crown, root and cutting rots are *C. spathiphylli*, *C. pteridis*, *C. cylindrospora*, *C. kyotensis*, and *C. ilicicola*.

One of the major considerations in managing *Calonectria* diseases is that the pathogen is very persistent. The fungus produces microsclerotia within infected tissues (roots, leaves, stems) that allow the pathogen to survive for years. Spores then develop from the surviving microsclerotia and are water-splashed to new tissues. Spores developing from new infections are then water-splashed to adjacent plants or can be washed from containers and move in water streams across greenhouse benches or floors. In the case of the infected *Spathiphyllum*, it is extremely important to monitor *Spathiphyllum* hanging baskets for infection because spores can be washed from the baskets into the *Spathiphyllum* crop on the benches below after each irrigation. Following good sanitation practices to reduce pathogen survival and spread is critical in controlling this disease.



Figure 4: *Calonectria spathiphylli* also causes dark, water-soaked petiole and leaf lesions when spores are splashed onto the foliage. Image by Brian Harding



Figure 5: Petiole and crown infections enlarge and kill the plant stem. Infected plants must be discarded. Image by Brian Harding

Aside from *Calonectria spathiphylli* causing root rot, it can also cause petiole rot and leaf blighting when spores are splashed onto *Spathiphyllum* foliage. The lesions are dark, water-soaked, and often have a yellow halo (Figure 4) that resemble symptoms often associated with bacterial diseases. Petiole and crown infections expand causing sunken, water-soaked rot that will kill the plant stems (Figure 5).

Another example of *Calonectria* sp. causing root and crown disease was on a trumpet pitcher plant (*Sarracenia* sp.) submitted to the UGA Plant Disease Clinic. Infected plants had rotting roots and dead pitchers and rosettes (Figures 6 and 7). After incubation, spores of *Calonectria* sp. were seen growing abundantly from the infected tissues (Figure 8). *Calonectria* spores are cylindrical and produced in clusters at the tip of branched conidiophores. Within the plant nursery, the disease was causing significant crop loss, especially on plants that were nutritionally stressed.

Calonectria crown and root disease is best managed by strict sanitation protocols. Discard infected plants immediately and cleaning greenhouse areas (benches, floors, pots, rails, irrigation lines, etc.) of all plant debris. Do not re-use rooting medium or containers. Plant wetness should be minimized by avoiding overhead irrigation to reduce water-splashing spores. Improving air circulation with fans and increasing plant spacing and reducing relative humidity within the greenhouse can also help reduce disease development. Fungicide drenches are also needed to reduce *Calonectria* spread and infection of roots and crowns. Fungicides should be used preventively to protect plants from infection. Fungicide applications will not cure already infected plants. Fungicides containing Fungicides as a drench containing benzovindiflupyr + azoxystrobin, cyprodinil + fludioxonil, boscalid + pyraclostrobin, fludioxonil, triflumizole, and thiophanate methyl

are very effective. Fungicide resistance is known for thiophanate methyl. It is important to rotate fungicides with different modes of action to reduce developing fungicide resistance. Use all fungicides according label rates and guidelines.

Hosts of *Calonectria* sp. causing root, crown, stem or cutting rots

Herbaceous hosts: *Anthurium*, *Blephilia ciliate* (Ohio horsemint), *Chrysanthemum*, *Cissus*, *Cordyline*, *Crassula*, *Crotalaria*, *Cuphea*, *Dianthus*, *Erica* (Cape Heath), *Euphorbia*, *Heuchera*, *Lupine*, *Mandevilla*, *Nephrolepis exaltata* (Boston fern), *Pincushion Protea* (*Leucospermum conocarpodendron*, *L. cordifolium*), *Pitcher Plants* (*Sarracenia*, *Nepenthes*), *Rumohra adiantiformis* (Leatherleaf Fern), *Spathiphyllum*, *Strelitzia nicolai* (Bird of Paradise)

Woody hosts: *Acacia*, *Acer* (Maple), *Araucaria heterophylla* (Norfolk Island Pine), *Callistemon* (Bottlebrush), *Camellia*, *Cercis* (Redbud), *Crabapple*, *Eucalyptus*, *Ficus*, *Gardenia*, *Gaultheria*, *Gordonia lasianthus* (Loblolly Bay), *Ilex* sp., *Leucothoe*, *Liriodendron*, *Liquidambar styraciflua* (Sweet gum), *Magnolia*, *Melaleuca leucadendra* (Weeping Paperbark), *Oleander*, *Palms* (*Chamaedorea elegans*, *Dypsis lutescens*, *Howeia* sp., *Laccospadix australasica*, *Washingtonia robusta*), *Papaya*, *Pinus* sp. (Pine), *Pyracantha*, *Picea* sp. (Spruce), *Rhododendron*/Azalea, *Rose*/*Rosa* sp., *Syringa* (Lilac), *Syzygium aromaticum* (Clove), *Vaccinium* (Blueberry), *Wisteria*



Figure 6: Death of Trumpet pitcher plant (*Sarracenia* sp.) rosettes due to *Calonectria* sp. infection of the roots, rhizome, and pitcher. Image by Ansuya Jogi.



Figure 7: *Calonectria*-infected plants have darkly discolored roots and rhizomes. The rot continues upward killing the pitchers. Image by Ansuya Jogi.



Figure 8: Pitchers and rhizomes become covered in white hyphae and spores. Cylindrical spores of *Calonectria* cluster together at the end of conidiophores. Image by Ansuya Jogi.

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CONTRIBUTORS

Dr. Nora Catlin
Floriculture Specialist
Cornell Cooperative Extension
Suffolk County
nora.catlin@cornell.edu

Dr. Chris Currey
Assistant Professor of Floriculture
Iowa State University
ccurrey@iastate.edu

Dr. Ryan Dickson
Greenhouse Horticulture and
Controlled-Environment Agriculture
University of Arkansas
ryand@uark.edu

Thomas Ford
Commercial Horticulture Educator
Penn State Extension
tgfz@psu.edu

Dan Gilrein
Entomology Specialist
Cornell Cooperative Extension
Suffolk County
dog1@cornell.edu

Dr. Joyce Latimer
Floriculture Extension & Research
Virginia Tech
jlatime@vt.edu

Heidi Lindberg
Floriculture Extension Educator
Michigan State University
wolleage@anr.msu.edu

Dr. Roberto Lopez
Floriculture Extension & Research
Michigan State University
rglopez@msu.edu

Dr. Neil Mattson
Greenhouse Research & Extension
Cornell University
neil.mattson@cornell.edu

Dr. W. Garrett Owen
Greenhouse Extension & Research
University of Kentucky
wgowen@uky.edu

Dr. Rosa E. Raudales
Greenhouse Extension Specialist
University of Connecticut
rosa.raudales@uconn.edu

Dr. Beth Scheckelhoff
Extension Educator - Greenhouse Systems
The Ohio State University
scheckelhoff.11@osu.edu

Dr. Ariana Torres-Bravo
Horticulture/ Ag. Economics
Purdue University
torres2@purdue.edu

Dr. Brian Whipker
Floriculture Extension & Research
NC State University
bwhipker@ncsu.edu

Dr. Jean Williams-Woodward
Ornamental Extension Plant Pathologist
University of Georgia
jwoodwar@uga.edu

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