

# Keeping Up with Root Rots

## Berkeleyomyces Is the New Black

*Read on for tips on root rot prevention and control.*

**BY MARGERY DAUGHTREY**

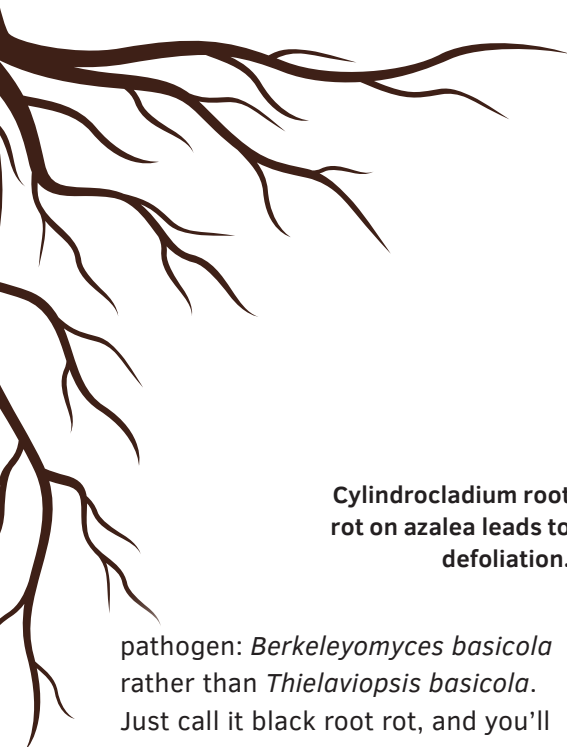
Usually root rot diseases are detected a few weeks after transplant, because the strong growth of the healthier plants makes it obvious that there is something **WRONG** with the ones that are being parasitized by a root rotter. The most common above-ground manifestation of root rot in your crop is an uneven stand. If you notice some plants looking great and others looking miserable, check for root rot by knocking plants out of their pots to take a look. Better yet, examine roots of your crops regularly to keep track of the health of the root systems.

Two categories of microorganism can lead to root rot in your plants: fungi and water molds. Because uptake of water and nutrients is disrupted by the infection, affected plants are stunted to various degrees, depending upon when they were infected — leading to that uneven look. Early indications include yellowing, purpling or graying of leaves, but eventually plants may slow their growth, wilt and die. Here are tips on how to outwit the six most common root rotters in the greenhouse.

**Black root rot.** The fungal root rot that we see most often is the one we used to call *Thielaviopsis* root rot. It was, and still is, also known as black root rot. Taxonomists have recently assigned a new name to the



**Black root rot can sometimes be distinguished by dark root discoloration, as shown here on poinsettia roots.**



Cylindrocladium root rot on azalea leads to defoliation.



pathogen: *Berkeleyomyces basicola* rather than *Thielaviopsis basicola*. Just call it black root rot, and you’ll never need to worry about going out of fashion. The new name honors Miles Joseph Berkeley, an Englishman born in 1803 who was one of the founders of plant pathology. This fungal pathogen has been particularly troublesome on calibrachoa, petunia, poinsettia, vinca, pansy and viola.

If your pH is high, 6.0 or above, that favors black root rot. When we conduct experiments in which we *want* disease so we can evaluate control measures, we lime heavily. Growers battling black root rot should use a pH in the mid-to-low 5s for the susceptible crops.

This fungus is often correlated with poorly draining mix and fungus gnat activity. Fungus gnat larvae can feed on a black-rotted root system, pupate, and then spread the causal fungus in their frass when they fly out as adults. Basil plants are not troubled by *B. basicola* in the field or in containers, but black root rot can be severe in hydroponic greenhouse crops of basil. The endospores produced by the fungus are easily moved with circulating water.

Once black root rot has struck a crop, it is extremely important not to reuse the flats, trays or pots for a later round of production of a susceptible plant. The fungus makes chlamydospores for long-term survival, and these will remain stuck onto plastic surfaces unless they are physically dislodged. Peroxide-, quaternary ammonium-

Temperature Preferences of Water Molds

<i>Globisporangium ultimum</i>	77 to 86° F
<i>Globisporangium irregulare</i>	86° F
<i>Pythium aphanidermatum</i>	95 to 104° F
<i>Pythium myriotylum</i>	98 to 104° F

Some Fungicides for Use Against Root Rots\*

FRAC Group	Common Name	Examples of Products	Pathogen Targets
1	thiophanate-methyl	3336, 6672, Banrot	Berkeleyomyces AKA Thielaviopsis, Cylindrocladium, Fusarium
2	iprodione	Chipco 26GT	Cylindrocladium, Rhizoctonia
3	triflumizole	Terraguard	Rhizoctonia, Berkeleyomyces AKA Thielaviopsis, Cylindrocladium, Fusarium
4	mefenoxam	SubdueMAXX	Pythium, Phytophthora
11 (or 11+7)	strobilurins	Compass, Heritage, Empress Intrinsic, Mural, Orkestra	Rhizoctonia, Phytophthora, Cylindrocladium, Fusarium
11	strobilurins	Broadform (sprays only) Orkestra	Rhizoctonia, Phytophthora
12	fludioxonil	Medallion	Rhizoctonia, Berkeleyomyces AKA Thielaviopsis, Cylindrocladium, Fusarium
14	etridiazole	Terrazole, Truban, Banrot	Pythium, Phytophthora
19	Polyoxin D	Affirm	Rhizoctonia
21	cyazofamid	Segway	Pythium, Phytophthora
33	Phos acids	Aliette, Fosphite, KPhite, Alude	Pythium, Phytophthora
43	fluopicolide	Adorn (must tank mix)	Pythium, Phytophthora
40	dimethomorph	Stature	Phytophthora
49	oxathiopiprolin	Segovis	Phytophthora

\* The information in this table is for information purposes only, and does not constitute a recommendation. Read and follow product labels: observe application restrictions and instructions to be sure that treatments are legal and safe for the plants (and site) you wish to treat. Rotate materials between FRAC groups as required.



or bleach-based disinfectants will sanitize surfaces to inactivate *B. basicola* inoculum.

**Fusarium root rot.** Some *Fusarium* species (e.g., *Fusarium solani*) can serve as root rotters without causing systemic infection. *Fusarium*, like *Berkeleyomyces*, is favored by overly wet soils, so good cultural conditions including well-drained mix will help to keep it from being a problem. *Fusarium* root rot is also triggered by overfertilization, especially with an ammonium-based fertilizer. Should you encounter a problem with a *Fusarium* root rot, try switching to a different mix with better drainage properties, and consider a calcium nitrate-based fertilizer.

**Rhizoctonia root rot.** *Rhizoctonia solani*, long known as a damping-off, web blight and stem canker perpetrator, can also cause root rot. It is important to keep field soil out of contact with a crop grown in a soilless mix, because soil often contains *Rhizoctonia*. Although stem base cankers are the forté of this pathogen, root rot is within its repertoire, particularly on woody plants such as azaleas and poinsettias. Overwatering is not necessary to trigger *Rhizoctonia* root rot. This disease is more an indication of a sanitation lapse.

**Cylindrocladium root rot.** The fungus *Cylindrocladium scoparium*, now renamed *Calonectria cylindrospora*, can cause root rot on many plants including roses, azaleas, mums, myrtle, nandina, dianthus, cuphea, geranium and eucalyptus. It can be hard to eradicate because it forms long-lasting microsclerotia that persist in organic debris on containers or benches. This fungus is favored by excess soil moisture. On azaleas, it causes leaf spots and stem infections, as well as root rot. *Cylindrocladium* root rot symptoms show primarily in warm seasons of the year: in culture, the fungus grows best at 77 to 86° F.

**Pythium and Phytophthora root rots.** Root rot may also be generated by water molds, particularly *Pythium*, *Globisporangium* (a number of renamed *Pythium* species) and *Phytophthora*. These are not true

fungi, and thus they require treatment with different chemicals. They form swimming spores called zoospores, so hydroponic culture is ideal for these pathogens. *Phytophthora* species or *Pythium myriotylum*, *P. aphanidermatum*, *Globisporangium ultimum*, *G.*

*irregulare* or *G. cryptoirregulare* can attack flower, vegetable or herb crops. When these pathogens find temperature suitable, they can infect roots in situations where water is abundantly available.

Overfertilization, overwatering and any root stress (such as

a dry-down) may promote the development of water mold root rot. Geraniums, poinsettias, mums, coleus, New Guinea impatiens and many other crops are known to be *Pythium*-susceptible; *Phytophthora* species show more host-specialization.



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Which species of Pythium attacks is often a matter of greenhouse temperature — some of the species prefer cooler temperatures, while others (such as *P. myriotylum* and *P. aphanidermatum*) like warm conditions. Sanitation is very important just as it is with fungal diseases: use new flats and pots and find suppliers with healthy plugs and liners.

PREVENTING ROOT ROTS

Preventing root rots is largely a matter of careful sanitation practices combined with providing good cultural conditions for the crops. Biological controls are particularly effective against

Root rot from Rhizoctonia attack on poinsettia.



Some Biofungicides Helpful Against Water Molds		
FRAC Group	Active Ingredient(s)	Product Names
44	<i>Bacillus amyloliquefaciens</i> / <i>B. subtilis</i>	Cease, Companion, Triathlon BA
BM 02	<i>Streptomyces</i> spp.	Actinovate, PreFence, Mycostop
BM 02	<i>Trichoderma harzianum</i> or <i>T. asperellum</i>	RootShield, Asperello
BM 02	<i>T. asperellum</i> + <i>T. gamsii</i>	Obtego
BM 02	<i>T. harzianum</i> + <i>T. virens</i>	RootShield Plus+
NC	<i>Pseudomonas chlororaphis</i>	Howler



To monitor for symptoms of root rot, knock plants out of their pots to look for discolored roots.



Effects of Pythium infection are apparent on root tips at the base of the pot: roots are discolored and softened.

Pythium root rot; used preventively, they will help against other diseases as well. With crops that have been troubled by root rot disease in the past, a rotation of appropriate fungicide drenches may be needed. Follow label directions and check for mention of crops sensitive to the chemistry. Rotating between or among FRAC groups helps avoid problems with pesticide resistance. Many greenhouse Pythium populations have shown resistance to mefenoxam, for example, so avoid making the mistake

of repeated exposing your crop to the same active ingredient over and over again without rotating to a material with a different mode of action (different FRAC group). Rotation prolongs the effectiveness of a fungicide by frequently changing the selection pressure on the pest population. [gpn](#) Margery is senior Extension associate at Cornell University's Long Island Horticultural Research & Extension Center and can be reached at [mld9@cornell.edu](mailto:mld9@cornell.edu).