

COMBATING BLACK ROOT ROT

ONCE ESTABLISHED, THE PERSISTENT AND DAMAGING PATHOGEN — THIELAVIOPSIS — CAN BE TOUGH TO ERADICATE. HERE ARE SOME GUIDELINES TOWARD PREVENTION.

By A. R. Chase and Margery L. Daughtrey

Black root rot (BRR) caused by the fungus *Thielaviopsis basicola* is a very persistent and damaging disease for growers of bedding plants, herbaceous perennials and some woody species — including poinsettias. This disease is seen most often on pansy, viola, vinca, calibrachoa, petunia and poinsettias. It causes little to no symptoms on some cultivars and species, so it can easily be passed from greenhouse to greenhouse on healthy-appearing plants. On a highly susceptible cultivar, however, *Thielaviopsis* causes serious growth reduction and crop losses that are quite dramatic. Some crops, like poinsettias, can go for years without any outbreaks of black root rot.

The Pathogen and How It Gets Around

The most common way we see *Thielaviopsis* spread in a greenhouse or nursery is on infected propagation material (like plugs) or by reusing flats or pots and failing to clean growing surfaces (benches). Once the disease becomes established in an operation it can be very tough to eradicate. This fungal pathogen makes two types of spores (see Figure 4, page 12). One type is formed in chains: they are clear and rather fragile — these move easily with splashing water from irrigation. The other type is a chlamyospore and is dark brown-black (thus the name black root rot) — it forms as a “resting” or long-term spore. These chlamyospores stick to sides of flats, bench surfaces and other greenhouse materials and can last a long time. The dark color provides a type of sunscreen effect and they have thick walls that keep them from drying out and dying.

How to Recognize BRR

Scouting for *Thielaviopsis* means keeping a close watch on its favorite hosts, looking for any growth irregularity in the crop. If a viola crop looks uneven, with plants stunted to various degrees and some having yellow or purple foliage, examine the root systems. Rinsing a root system of a

Figure 1. Chlorosis (yellowing) of leaves on vinca infected with black root rot.

Table 1.

Some “Plant Prey” for <i>Thielaviopsis basicola</i>	
Common name	Scientific name
Pansy	<i>Viola x wittrockiana</i>
Viola	<i>Viola arvensis</i>
Calibrachoa	<i>Calibrachoa hybrids</i>
Petunia	<i>Petunia x hybrida</i>
Vinca (annual)	<i>Catharanthus roseus</i>
Vinca (vine)	<i>Vinca minor</i>
Snapdragon	<i>Antirrhinum majus</i>
Holly	<i>Ilex helleri</i> , etc.
Daphne	<i>Daphne odora</i> and hybrids
Fuchsia	<i>Fuchsia x hybrida</i>
Blanket flower	<i>Gaillardia x grandiflora</i>
Geranium	<i>Pelargonium x hortorum</i>
Lithodora	<i>Lithodora diffusa</i>
Poinsettia	<i>Euphorbia pulcherrima</i>



Figure 2. Black roots typical of BRR on petunia.

seriously stunted plant will often allow you to see areas of the roots that are stunted and blackened. Typically the above-ground symptoms resemble starvation, so don't be fooled into thinking this is a fertilization problem. Plant symptoms caused by a cultural error tend to have an even effect throughout the whole cultivar or species, whereas disease symptoms present a more irregular, scattered pattern. When receiving plugs of calibrachoa and other Thielaviopsis-prone crops, check the root systems to make sure they are very white and healthy looking. The root discoloration is not always dramatic, so you may need the help of a diagnostic lab to identify black root rot.

How to Prevent BRR Culturally

One way to avoid favoring black root rot is to adjust the pH of your growing media. Thielaviopsis

grows best (and is most harmful to plants) at a high growing pH, 6.2 and above. Adjusting the pH to 5.5 can reduce the impact of the fungus. Mixes that drain well are desirable, as the fungus is also favored by saturated soil conditions.

Don't Forget Sanitation

It is also especially important to keep the disease from cycling back into your crops year after year. This can happen easily if flats and pots are not scrupulously cleaned and disinfested after an outbreak. Reusing plastic containers after a bout of black root rot will ensure that the disease comes back to haunt you.

First, physically remove this debris by washing the containers, and then follow with a soak in a disinfectant. We did a series of trials at Chase Horticultural Research on killing this fungal pathogen on plastic, wood and concrete. The best treatments were use of a cleaner followed by a disinfectant. Our trials showed that KleenGrow was significantly more effective than

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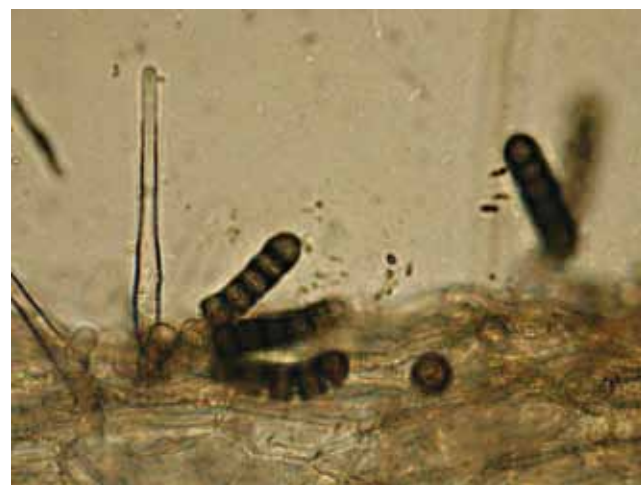
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Figure 3 (left). Creeping phlox showing symptoms of BRR. Stunting is very common.
Figure 4 (right). Spores of *Thielaviopsis basciola*.



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Figure 5. Black root rot prevention on pansy (Chase Horticultural Research Inc. 2010). Rates are oz/100 gal applied as drenches. The bars show plant height, which was a good indication of BRR severity — taller plants were healthier than shorter ones.

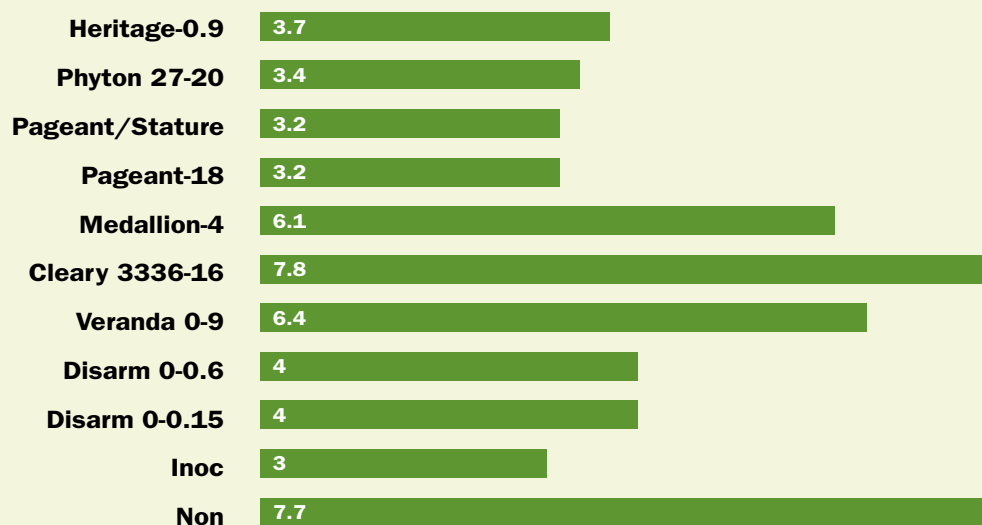


Table 2. Black root rot prevention on vinca (Chase Horticultural Research Inc., 2011). Top grade was rated from 1 (dead) to 5 (excellent). Numbers in the same column with the same letter are not significantly different.

Treatment	Rate/100 gal.	Top grade 8-23-11	Percent healthy roots 9-1-11
Water Noninoculated	-----	4.8 e	64.0 d
Water Inoculated	-----	4.5 de	47.0 bc
Cleary's 3336	16 oz	4.4 de	65.0 d
Veranda O	8 oz	4.2 d	63.0 d
Affirm	8 oz	4.4 d	61.1 d

bleach, GreenShield or ZeroTol.

Research on cleaning flats in the tobacco industry (also plagued with BRR) has shown very good results with steam cleaning. Research on cleaning flats for pansies (Warfield, NCSU) showed that ZeroTol was effective when sprayed onto plug trays at 2.5 ounces per gallon, and Greenshield was effective when used as a 10-minute dip at 1 tablespoon per gallon. General greenhouse sanitation

measures, such as not dropping the watering hose end onto the greenhouse floor, also help to keep *Thielaviopsis* out of the crop.

Finally, research has also shown that certain common greenhouse insects can carry spores of *Thielaviopsis*. This is just one more reason to keep fungus gnats, shore flies and moth flies under control: fungus gnats, in particular, are able to injure a diseased root system further,

and to spread the fungus within the greenhouse.

Preventing BRR with Fungicides

The first thing to remember — and try to believe — is that you cannot treat plants already affected with BRR. You must be preventative or you are wasting your fungicide dollars. For many years the best and most reliable fungicides for black root rot have included the active ingredient thiophanate-methyl (or others in the benzimidazole group - MOA 3). While other fungicides have sometimes given some control, those containing a benzimidazole have always provided the best control. It has been interesting to see that while these fungicides have provided excellent control on pansies, they can fail on vinca, which may be considerably more sensitive to this pathogen. Also, even the most effective fungicides can fail when conditions are too favorable for disease. This happened in a trial a year or so ago conducted in Texas by Dr. Karl Steddom on vinca.

Products that have shown good efficacy at times (but not as consistently as thiophanate-methyl) include azoxystrobin, fludioxonil and triflumizole as active ingredients. In addition, biologicals (those containing *Trichoderma*) sometimes have been effective.


In 2010, polyoxin D was labeled for ornamentals as both Veranda O and Affirm. It has been available as Endorse previously but we don't remember seeing any trials on Endorse until Veranda O was registered. The products are both very effective on controlling black root rot based on trials from California, Texas and Michigan. While control is very good to excellent, it has not been as effective as thiophanate-methyl in these research trials. One of the best aspects of using these products is a high level of reliable control from a new MOA group (19) — this allows effective rotation to reduce the chances of resistance developing to the benzimidazole fungicides.

Conclusions

The most important keys to BRR prevention are:

1. Know which crops are hosts and what the disease looks like.
2. Maintain medium pH at a good level for the host but

below 5.5 if possible.

3. Do not reuse flats or pots unless you use an effective sanitation program.
4. Use the most effective fungicides (those with thiophanate-methyl, polyoxin-D, triflumizole or fludioxonil) preventively. 

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