



Black Root Rot: *Thielaviopsis basicola*

Introduction

The fungus *Thielaviopsis basicola* (syn. *Chalara elegans*) is the causal agent of black root rot. The fungus infects a wide range of hosts, including plants from at least 15 families, and can be found in all parts of the world. Sources of *T. basicola* that may help spread diseases include untreated soil or peat moss.

Symptoms and Signs

Symptoms of black root rot are typical of many other root rots or root problems. Some of these symptoms may include yellowing of the plant, defoliation, stunting or wilting, as well as red brown lenticels and swelling of the crown. The fungus produces black spores in roots that when abundant cause the black lesions that are typical of black root rot. *Thielaviopsis basicola* can also attack seedlings, and the hypocotyl below the soil may become infected along with the roots.

Infected tissue is first seen as elongated red lesions, which eventually turn black. In severe cases the entire root may appear black. Stunting of tap-root growth also occurs. Plants may develop new roots following infection, but they can only support the plant when sufficient moisture is available. If unchecked, root rot can lead to collar rot, causing wilting of leaves and tender stems

Disease Cycle

The fungus produces more than one type of spore. The Chalara state produces endospores, small, single cell, hyaline (clear) conidia. These may be more difficult to detect in or on plant tissue. The *Thielaviopsis* state produces dark aleuriospores that

are composed of a short chain of spores that eventually break up into individual chlamydospores. These chains of spores are highly characteristic of this fungus.



Figure 1: A few clear endospores and conidiophores from which they developed (provided by S.L. Jensen, Cornell University)

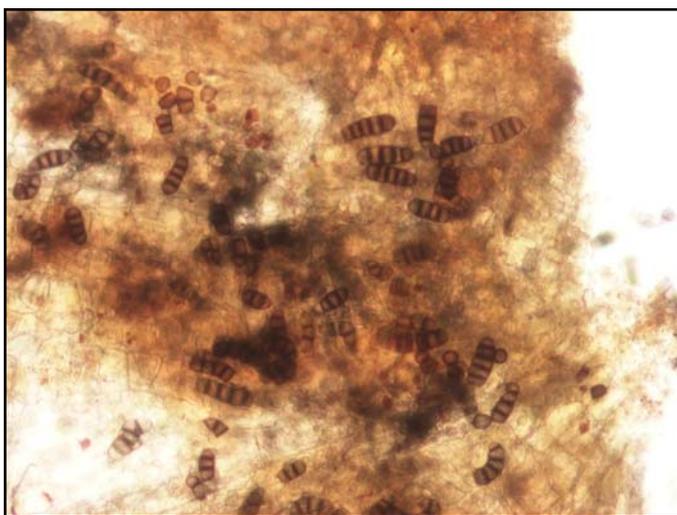


Figure 2: Numerous dark aleuriospores in squashed root tissue (provided by S.L. Jensen, Cornell University)

Chlamydospores are a type of resting spore and may survive in soil for many years. These spores are stimulated to germinate by compounds produced by the roots, if conditions are favorable. Favorable conditions include a soil pH between 5 and 8.5 with a soil temperature between 55 and 70°F. Saturated soil can also increase disease, as well as increase the overall stress on the plant. The fungus can spread from infected roots to healthy roots if they come into contact. Spores can also be splashed from pot to pot when watering.



Figure 3: Close-up of aleuriospores breaking up into individual chlamydospores (provided by S.L. Jensen, Cornell University)

Management Strategies

Once the disease has become established it is often difficult to manage or control, so preventing new infections is the best management option for *T. basicola*, and good sanitation is the key to prevention. In the greenhouse or nursery, avoid re-using pots or plug trays from infected plants. Inspect plants when purchasing. If plants wilt readily and/or roots appear dark, do not purchase or avoid transplanting into flower beds, etc.

Stress or adverse growing conditions can also increase the likelihood of disease development, and include factors such as saturated soils, salt build up, and adverse temperatures. Another environmental factor is soil pH. Maintaining a soil pH below 5.6 has been shown to decrease severity of symptoms. Several fungicides have proven effective, but may be most effective when used preventatively or at first sign of disease. Fungicides can not compensate for poor sanitation or environmental controls. Fungicides

should be used at first sign of disease, and should be used in combination with the cultural controls noted below.

1. Maintain a soil pH below 5.6.
2. Remove and destroy all diseased plants.
3. Use soil-less media when possible.
4. Sterilize all equipment.
5. Keep work areas clean.
6. Fungus gnats and shore flies may be vectors . Control these pests to minimize spread of the fungus.
7. Water in a manner that minimizes splashing of soil.

Fungicides registered to help manage *T. basicola* in nursery or landscape plantings in New York include some restricted-use fungicides containing the active ingredient thiophanate-methyl or bio-fungicides containing *Trichoderma Harzianum* var. *Rifai* ; the latter may be best used at planting time. In addition, Terraguard SC (containing the restricted-use fungicide triflumizole) is registered for some nursery uses. Additional products may also be available, but be sure to check that the product is registered in your state for your crop, and follow label directions.

Some plants have been shown to be especially susceptible to this pathogen and include *Begonia* spp., *Catharanthus* spp. (Madagascar periwinkle), *Cyclamen persicum*, *Fuchsia X hybrida*, *Gerbera jamesonii* (African daisy), *Pelargonium* spp. (florist's geranium), *Pericallis X hybrida* (cineraria), *Scindapsus aureus*, and *Viola* spp. A more extensive listing of plants that have been reported to be susceptible to infection by this fungus follows.

ORNAMENTALS: Trees, Shrubs
<i>Buxus sempervirens</i> - Boxwood
<i>Camellia japonica</i> - Camellia
<i>Casuarina cunninghamiana</i> - River Oak
<i>Catalpa speciosa</i> - Northern Catalpa
<i>Citrus</i> spp.
<i>Ilex</i> spp. - Holly
<i>Poncirus trifoliata</i> - Bitter Lemon
<i>Syringa vulgaris</i> - Lilac
<i>Ulmus americana</i> - American Elm

ORNAMENTALS: Flowers, Houseplants

Antirrhinum majus - Snapdragon
Astilbe spp.
Begonia semperflorens - Wax Begonia
Brugmansia spp. - Angel's Trumpet
Catharanthus roseus - Madagascar Periwinkle
Cyclamen persicum
Cymbidium spp. - Boat Orchids
Datura metel - Devil's Trumpet
Epipremnum aureum - Silver Vine
Euphorbia - 'Spurges'
Fuchsia X hybrid
Gaillardia spp. - Blanket flower
Gerbera jamesonii - African Daisy
Hypericum calycinum - St. Johns Wort
Kalanchoe spp.
Lathyrus spp. - Sweet Pea
Linaria canadensis - Blue Toadflax
Lupinus spp - Lupine
Paeonia spp. - Peony
Pelargonium spp. - Geranium
Penstemon spp.

ORNAMENTALS: Flowers, Houseplants cont.

Pericallis X hybrid/Senecio spp. - Florist's Cineraria
Petunia spp.
Phlox paniculata - Perennial Phlox
Poinsettia spp.
Scindapsus aureu - Money Plant
Verbena x hybrida - Verbena
Viola spp. - Violet / Pansy
Zantedeschia spp. - Arum / Calla Lillies

OTHER: Fruits, Vegetables, Herbs, Forages

Armoracia rusticana - Horseradish
Daucus carota - Carrot
Fragaria x ananassa - Strawberry
Lycopersicon esculentum - Tomato
Phaseolus sp. - Bean
Pisum sativum -Pea
Trifolium spp. - Clover
Vigna spp. - Bean (Mung, Azuki, etc.)

References:

http://www.ars.usda.gov/research/publications/publications.htm?seq_no_115=144000

http://www.cals.ncsu.edu/course/pp728/Thielaviopsis/thielaviopsis_basicola.htm

<http://hortipm.tamu.edu/pestprofiles/disease/thiel/thiel.html>

http://nt.ars-grin.gov/fungalatabases/new_allViewGenBank.cfm?thisName=Thielaviopsis%20basicola&organismtype=Fungus&CFID=116033&CFTOKEN=51153172

Pscheidt, J.W., and Ocamb, C.M., senior editors. 2014. Pacific Northwest Plant Disease Management Handbook [online]. Corvallis, OR: Oregon State University. <http://pnwhandbooks.org/plantdisease> (accessed 15 Jan. 2015).

Written by Matt Walker, 2008; updated SLJ 1/15

READ THE LABEL BEFORE APPLYING ANY PESTICIDE! Changes in pesticide regulations occur constantly. All pesticides distributed, sold, and/or applied in New York State must be registered with the New York State Department of Environmental Conservation (DEC). Questions concerning the legality and/or registration status for pesticide use in New York State should be directed to the appropriate Cornell Cooperative Extension Specialist or your regional DEC office.

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