When sticking unrooted cuttings or at transplanting use Medallion® (1 oz for sticking unrooted cuttings or 1–2 oz for drenching plug plants) or Hurricane™ (1.5 oz). Fourteen to 21 days later, begin fungicide drench program rotating Terraguard®, Medallion, and Cleary's 3336®/OHP 6672® as described below:

Prevention:
Apply prior to disease when the crop is susceptible or the greenhouse has a history of Thielaviopsis. Drench every 21 days with fungicides using labeled rates and alternate among the following:

- Medallion 50WP: 1 oz/100 gal or Hurricane: 1 packet (1.5 oz/100 gal
- Terraguard 50W: 4 oz/100 gal
- 3336 50WP/3336 F: 12–16 oz/100 gal or OHP 6672 50W: 12–16 oz/OHP 6672 4.5L: 20 fl oz

Seeding rate: 3336 (8 oz rate) or Medallion (1 oz rate) or Hurricane (1 packet/200 gal)

Active infection:
Implement when disease first occurs. Use high labeled rates of fungicides, apply every 14 days, and alternate among the following:

- Medallion 50WP: 2 oz/100 gal
- Terraguard 50W: 4–6 oz/100 gal
- 3336 50WP/3336 F: 16 oz/100 gal or OHP 6672 50W: 12–16 oz/OHP 6672 4.5L: 20 fl oz

Rates are given as amount of product per 100 gal. Please review all product labels for instructions before making an application to your crop.

Call 1-866-SYNGENTA (796-4368) to contact the Syngenta Customer Center and learn more.

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Identifying and treating *Thielaviopsis* black root rot

**Disease symptoms**

*Thielaviopsis basicola* is the causal agent for this disease. Initially, infected plant roots become speckled with light brown lesions. Roots turn brown, then black, and disintegrate. Diseased plants become stunted. Leaves may turn yellow and older leaves are shriveled. In mild infections, older leaves turn yellowish-green with the veins remaining green. Young leaves become stunted and tinged with red. In some crops, the disease causes dark, sunken lesions or cracks on the lower stem.

*Thielaviopsis* black root rot gets its name from special fungal spores (chlamydospores) formed in the root. Under the microscope, chains of these dark brown, barrel-shaped spores can be seen in rotting roots. When these chains break, each individual spore can germinate and cause a new infection.

**Crop damage**

Diseased roots cannot absorb nutrients and water. These infected plants are weakened and exhibit signs of stunted growth and nutrient deficiency. When bedding plants become infected, their uneven growth can make an entire flat unmarketable even though not all plants are diseased. Replacing stunted plants in the flat is time consuming and costly. Severely diseased plants often die.

**Susceptible crops**

Many crops are susceptible to *Thielaviopsis* black root rot (see list below).

- **Begonia**: Plants become yellow, stunted, and may die. Look for dark lesions on roots and the lower stem near the soil surface. Infected seedlings wilt and die.
- **Cyclamen**: Fine roots become dark and diseased. Tubers and petioles are usually not affected. White-flowered varieties may be more susceptible than red-flowered types.
- **Fuchsia**: Diseased plants are stunted and roots show symptoms of rot.
- **Impatiens**: Infected roots become dark and rot. Sunken lesions may develop on lower stems.
- **Nicotiana**: Infected plants are stunted and show symptoms that resemble nutritional deficiency. Roots develop dark lesions.
- **Pansy and Petunia**: Plants grow slowly, and then die. Leaves become yellow and wilt. Roots are black and rot.
- **Poinsettia**: Serious root rot can become evident in late season as plants mature. Infected plants are stunted with misshapen leaves and flower bracts. Leaves roll inward, with lower leaves becoming yellow and dropping. Black, rough, longitudinal cracks occur frequently on the portion of the stem below the ground. Leaf spotting may also occur.
- **Primula**: Early symptoms include small black spots on the roots. Roots become brown and disintegrate. Young plants are stunted and leaves turn yellow and are tinged with green-red coloration. In mild infections, older leaves remain green but are tinged with yellow-green.
- **Snapdragon**: Roots rot, plants grow slowly and die. Leaves yellow and wilt. Stems develop black cracks just below the soil surface.
- **Verbena**: Foliage becomes yellow and wilts. Plants grow slowly and die. Roots become black and disintegrate. Dark cracks form on stems below ground.
- **Vinca**: Shoots, leaves, and stems yellow and wilt. Roots become black and decay. Stems develop black cankers. Plants grow slowly and may die. Seedlings damp off.

**Checklist**

- Leaves turn yellowish/pale green with green veins.
- Bottom leaves curl downward.
- Roots become dark, blackened, and rot.
- Sunken lower stem lesions may develop.
- Plants are stunted.

**Cultural tips**

A dry, clean growing environment coupled with preventive fungicide treatments can protect susceptible crops.

**Perennials**

Symptoms on perennials from black root rot may be subtle and include poor overall growth, brown/black lesions, and root rot. The list below includes some of those perennials that are susceptible to *Thielaviopsis*.

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**Maintain optimal growing media conditions**

Prolonged periods of wetness or saturated media conditions favor disease development. For crops grown outside, maintain moisture levels closely and adjust irrigation accordingly, particularly after a rain event. Black root rot is especially favored by low soil temperatures (55° to 61° F) but disease can develop at higher temperatures (up to 75° F).

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**Maintain a slightly acidic growing medium.** Neutral or alkaline soils favor disease.

**Identify the cause of root rot.** Above-ground symptoms of black root rot can mimic nutrient deficiencies and other root rots caused by *Pythium*, *Rhizoctonia*, and *Phytophthora*.

**Remove infected plants/plant parts immediately to limit spread.** Place infected plants into closed containers/bags along with the growing container.

**Ensure a clean growing area.** Thoroughly clean infected plants and equipment. Cultivation practices that maintain a clean growing environment are critical in managing *Thielaviopsis*-induced disease. Immediately remove and destroy all infected plants. Preventive fungicide treatments can provide control.