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## Black Root Rot on Pansy...Keep Looking at Those Roots!

*Pansies (Viola spp.) are very susceptible to black root rot. The symptoms of black root rot are: chlorotic lower foliage, poor rooting, lack of growth, and the blackening of the roots.*

Last week, Drs. Paul Thomas (Professor of Horticulture) and Jean Williams-Woodward (Associate Professor of Plant Pathology) from the University of Georgia alerted growers to keep an eye out for black root rot (*Thielaviopsis basicola*) in their young plants. *Thielaviopsis* is also being reported in northern greenhouses. In southern greenhouses it is most commonly found on petunia, calibrachoa, and vinca, while it is more commonly detected on pansies (*Viola* spp.) in Michigan.

Diagnosing *Thielaviopsis* on plants can be difficult. The symptoms of black root rot are similar to that of other root rots. Therefore, be sure to send your plants to a diagnostics lab to verify the root rot infecting your plants. The initial symptoms are: chlorotic lower foliage, poor rooting, lack of growth, and wilting (Fig. 1). The chlorosis, or yellowing of the foliage, is common

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Figure 1. Pansies infected with black root rot first exhibit chlorotic lower leaves and is often mistaken for a nutritional management problem.

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among root rot diseases. Root rots prevent sufficient nutrient uptake and often lead to nutrient deficiencies. In fact, *Thielavopsis* root rot is often misdiagnosed by growers as a nutrient management problem. As the fungal infection advances, the roots will become completely black, covered with black elongated lesions (aleuriospores) which are visible when viewed under a microscope (Fig. 2). The root hairs and secondary roots will rot and the tap root will continue to blacken (Fig. 3).



Figure 2. Black elongated lesions (aleuriospores) on roots are characteristic of black root rot when viewed under a microscope.

Courtesy of Dr. Jan Byrne (Michigan State University).



Figure 3. Pansy without *Thielaviopsis* (left) has healthy white roots while pansy infected with *Thielaviopsis* (right) is chlorotic, stunted, with black roots. Courtesy of Dr. Jan Byrne (Michigan State University).

Pansy is a cold-tolerant crop which has the quickest flowering time when grown at 71 ° F, but plant quality is better at lower temperatures (<65 ° F). Pansies have the greatest flower size and the most abundant rooting when grown at 55 ° F or lower. For example, Purdue researchers demonstrated this concept when maintaining an air temperature of 60 ° F: plant quality increased with decreasing root zone temperature (Fig. 4).

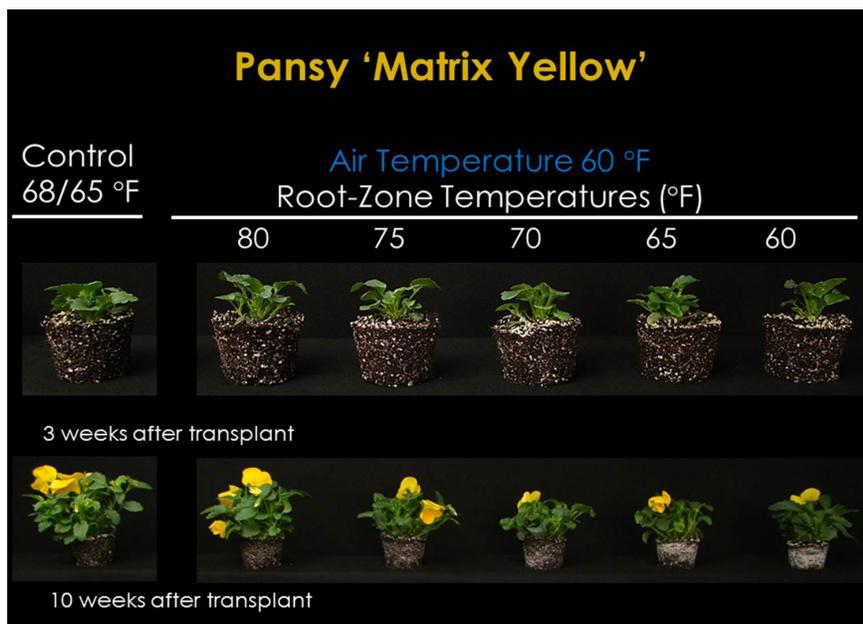


Figure 4. Plant quality (rooting and plant compactness) increased with decreasing root-zone temperature on Pansy 'Matrix Yellow.'  
 Courtesy of Joshua Gerovac and Dr. Roberto Lopez (Purdue University).

Unfortunately, the optimal growing conditions of pansies are similar to those that are the most favorable for *Thielaviopsis* root rots: media

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temperatures between 55 and 75 ° F. Pansies are also acidic-loving bedding plants that prefer a media pH between 5.4 and 5.8, while the most favorable conditions for this soil-borne fungus are pHs between 5.5 and 6.0. Growers should manage the pH, temperature, and scout regularly in order to quickly detect black root rot. pH management is also essential in preventing both boron and iron deficiencies in pansy.

If a grower receives confirmation that plants in their greenhouse are infected with *Thielaviopsis*, growers should first throw out all plants exhibiting symptoms and continue to scout the neighboring plants for symptoms of the root rot (Fig. 5).



Figure 5. Pansies infected with black root rot should be discarded (bottom flat) and surrounding pansies (top flat) should be treated with the recommended control products. Courtesy of Dr. Jan Byrne (Michigan State University).

Similar to other root rots, *Thielaviopsis* is spread by splashing water from infected plant material and by fungus gnats and shore flies. Growers should minimize splashing and tight-spacing of plants. Elevating the plants that are grown on the ground off of the black mat will prevent further spread of the disease. As *Thielaviopsis* produces a type of resting spore, chlamydospores, sanitation will be extremely important during the growing season when it has been detected. Irrigation equipment, benches, floors, and mats should be regularly sanitized with products such as quaternary ammonium (e.g., Green Shield) or hydrogen dioxide (e.g., ZeroTol).

Growers will also need to treat uninfected neighboring plants with a fungicide to prevent the spread of the black root rot. According to Michigan State University Extension's 2016 disease management recommendations, the following products should be applied at their high label rates; thiophanate-methyl (e.g., Clearys 3336/OHP 6672), triflumizole (e.g., Terraguard SC/LS), or fludioxonil (e.g., Medallion).

Growers should also implement an insect management program for fungus gnats and shore flies, as they can spread the disease. For those using biological control, begin by treating young plants early in the morning or in the evening with the beneficial nematode, *Steinernema feltiae*, which may be effective for up to 4 weeks and attacks the larval states of fungus gnats. Growers should be sure to apply 50 million nematodes per 1,000 square feet as a drench and also irrigate the crop with clear water before and after the application. Two predators [rove beetle (*Dalotia coriaria*) and mite (*Stratiolaelaps scimitus*)] are also effective in controlling fungus gnats and shore flies. Growers should release 1 rove beetle adult per 10 square feet or release 1,000 to 2,000 predatory mites per square foot. Greenhouse growers using biological control should contact their biocontrol supplier for recommendations before making an application or beneficial insects (Fig. 6).

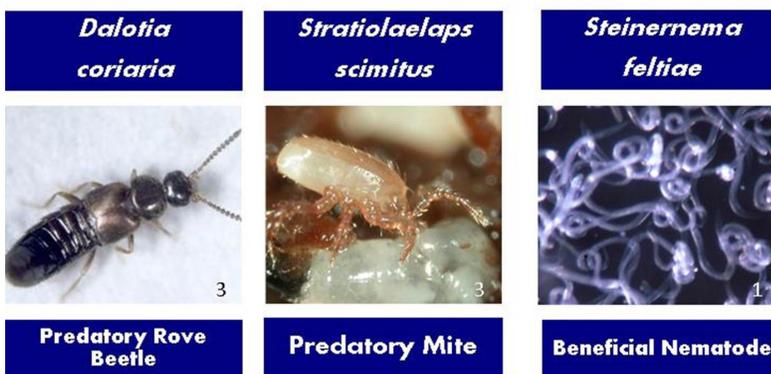


Figure 6. Commercially available predators and beneficial nematode for fungus gnat control. Photos courtesy of Evergreen Growers Supply<sup>3</sup> and Koppert Biological Systems<sup>1</sup>.

Growers should prevent root rots in their crops by preventing stressful conditions such as under or overwatering plants. For optimal plant health, maintain an appropriate pH for each crop, allow for adequate spacing and aeration, and irrigate the crop so that it will dry out each day. When growing plants that are more susceptible to *Thielaviopsis*, you may want to consider applying preventive applications of the recommend control products (Fig. 7).



Figure 7. Pansy growers may want to consider a preventative *Thielaviopsis* fungicide program.