Dothistroma and Lophodermium Needle Cast: Key Similarities and Differences

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Overview:

Needle cast or needle blight diseases are common problems of pines (*Pinus spp.*) in nurseries, Christmas tree plantings and landscapes. Dothistroma needle cast and Lophodermium needle cast are the two most common fungal diseases that primarily infect pine trees. These diseases are often confused because their symptoms look similar. Accurate identification is important since management timing differs between them.

Quick Tips

Diagnosis

- Dothistroma: Red bands girdle the needle
- Lophodermium: Uniform yellowing or browning of needles with black elongated fruiting bodies appearing on dead needles

Infection

- Dothistroma: Spring infection
- Lophodermium: Late-season infection

Management (Fungicides)

- Dothistroma: Most effective when applied in spring and early summer
- Lophodermium: Most effective when applied in late summer and fall

Dothistroma needle blight

Dothistroma needle blight is a common disease of pines caused by the fungal pathogen, *Dothistroma septosporum*. It is also known as "red band needle disease." The main hosts of the disease are several species of pine, particularly hard pines (two- and three- needle pines). In Tennessee, it is most frequently observed on Austrian pine (*Pinus nigra*).

Symptoms typically develop during cool, wet spring weather. Early symptoms appear as yellow to tan spots or chlorotic bands on needles. The bands later turn brown to reddish-brown, giving the disease the name "red band" (Figure 1A and 1B). The bands often girdle the needles, causing the tips to die while the base remains green (Figure 1 B). As the infection progresses towards the base, the entire needle dies and drops prematurely. Symptoms usually begin in the lower canopy and gradually move upwards (Figure 2). After the needles die, a black fungal structure called "stroma" develops and produces spores. These spores are spread mainly by rain splashes. Young trees are most susceptible. Severe infection can lead to significant defoliation and reduced tree growth.

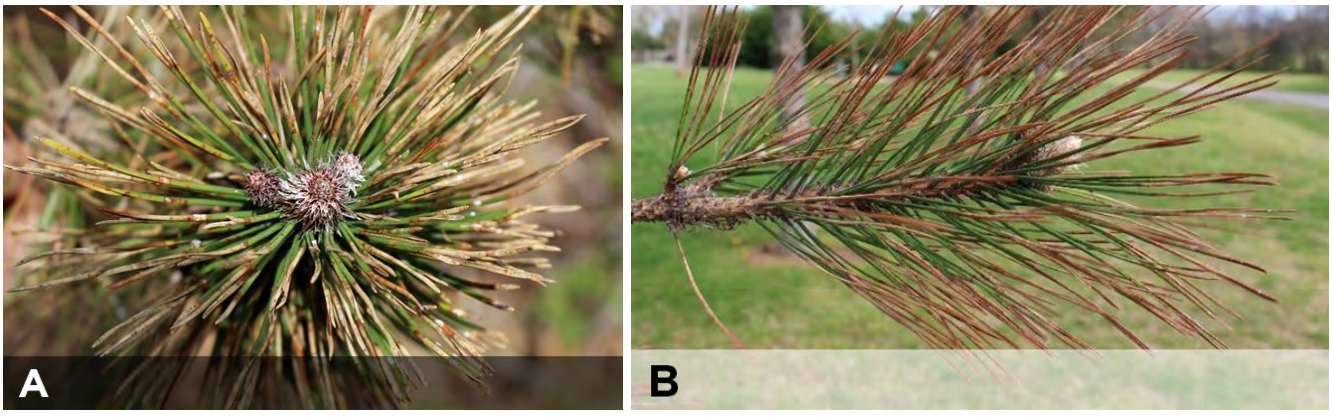

Figure 1: *Pine needles infected with Dothistroma needle cast: (A). Frontal view of an infected branch. (B). Lateral view of an infected branch. (Image credit: Alan Windham, Emeritus Professor, University of Tennessee Institute of Agriculture)*

Figure 2: *A pine tree infected with Dothistroma needle cast in a landscape setting. (Image credit: Alan Windham, Emeritus Professor, University of Tennessee Institute of Agriculture)*

Lophodermium needle blight

Lophodermium needle blight is a fungal disease caused by *Lophodermium* species, most commonly *Lophodermium seditiosum*. The disease primarily infects Scots pine but has also been reported on eastern white and red pine, especially in Christmas tree plantings. Infected needles first develop small, uniform yellow spots that often merge. As the disease progresses, the entire needle turns brown to straw-colored and drops prematurely. By the late summer and fall, dead needles develop distinct black, football-shaped fruiting bodies. These structures produce spores and infect healthy needles when late fall rains begin. Seedlings in nurseries are particularly vulnerable and may die under favorable wet, humid conditions.

Figure 3: *Pine needles infected with Lophodermium needle cast showing typical symptoms and black football-shaped fruiting bodies. (Image credit: Ralph.S. Byther, Washington State University)*

Table 1. Similarities between Dothistroma and Lophodermium needle cast

Feature	Similarities
Host range	Both primarily affect pines (*Pinus spp.*)
Plant part affected	Pine needles
Symptoms	Needle browning and premature needle drop
Favorable conditions	Moist, humid conditions
Management	**Cultural practices include:** • Increase spacing and air movement. • Avoid overhead irrigation. • When possible, remove heavily infected branches and fallen needles. • Use plant species suited to the site.

Table 2. Key differences between Dothistroma and Lophodermium needle cast

Feature	Dothistroma needle cast	Lophodermium needle cast
Causal Organism	*Dothistrom septosporum* *D. pini* (Barnes et al. 2014)	*Lophodermium seditiosum* and related spp.
Main Hosts	• Austrian pine (*Pinus nigra*) (most common) • Ponderosa pine (*P. ponderosa*) • Lodgepole pine (*P. contorta*) • Scots pine (*P. sylvestris*)	• Scots pine (*P. sylvestris*) (most common) • Red pine (*P. resinosa*) • White pine (*P. strobus*)
Symptoms	• Distinct red to brown bands encircle needles • Needles die from the tip downward • Tiny black fruiting bodies develop within the red bands • Current-year needles are commonly affected	• Needles turn uniformly yellow or brown color without distinct banding • No red banding pattern is present • Black, football-shaped fruiting bodies develop on dead needles • Primarily affects previous-year needles
Fruiting Bodies	Tiny black fruiting bodies, also known as 'stroma', erupt through red bands	Black, football-shaped fruiting bodies with a slit center slit, known as apothecia, develop along dead needles
Time of Infection	Spring infection, takes place in spring and early summer	Late season (summer-fall) infections, symptoms appear the following spring
Needle Age Affected	Often infect current-year needles	Infect slightly older, mostly previous-year needles
Disease Cycle	Polycyclic: multiple infection cycles take place during spring and early summer	Monocyclic: generally, one infection period in late summer to fall, symptoms appear the following spring
Severity Pattern	Can be severe in plantations and windbreaks	Often more common in dense shaded stands
Fungicide Timing	Protectant sprays in spring and early summer when new needles are expanding	Applications are most effective in late summer to early fall. However, applications made in early spring, before budbreak, can also provide effective control.

Table 3. List of some fungicide products and active ingredients labeled for pine needle cast

Trade Name	Active ingredient(s)	FRAC Code*	Typical Rate†	Disease listed on label
Kocide® 3000	Copper hydroxide	M1	0.5-1.75lb/A	Pine needle cast§
Badge®SC	Copper hydroxide/oxychloride	M1	3-6 pt/A	Pine needle cast§
CuPRO® 5000	Copper hydroxide	M1	3-5 lb/A	Pine needle cast§
DaconilZn®	Chlorothalonil	M5	4-8 pt/A	Lophodermium needle cast
Echo®720	Chlorothalonil	M5	2.7-5.5pt/A	Lophodermium needle cast
Dithane F-45®	mancozeb	M3	1.6-3.2 qt/A	Lophodermium needle cast
Pennxozeb®75DF	Manzozeb, Mn, Zn, $C_4H_6N_2S_4$	M3	2-4 lbs/A	Lophodermium needle cast

*FRAC Code – Fungicides with the same FRAC Code have the same mode of action. See http://www.frac.info/ for an explanation of the FRAC Codes. Rotation of fungicides with different FRAC Codes could minimize the development of fungicide-resistant strains.

†Always read and follow label directions when using any pesticide product. Commercial or professional-grade formulations are intended for licensed or trained applicators familiar with proper sprayer or spreader calibration, mixing and application techniques.

§Product labeled for "pine needle cast" (without specifying a single pathogen) may be effective against more than one needle cast disease. Always read and follow the most current label for specific use instructions.

References and Additional Resources

Barnes, I., Walla, J. A., Bergdahl, A., and Wingfield, M. J. 2014. Four new host and three new state records of Dothistroma needle blight caused by *Dothistroma pini* in the United States. Plant disease, 98: 10, 1443

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Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The authors, the University of Tennessee Institute of Agriculture and University of Tennessee Extension assume no liability resulting from the use of these recommendations.

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