Dothistroma Needle Blight

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Fig. 1. The red banding symptom observed on infected needles is the most distinctive symptom of this disease.

What You Should Know

Dothistroma needle blight is a fungal disease that occurs on a variety of coniferous trees. It is also known as “red band disease” in the western United States because of the distinct red banding symptoms that are produced. This banding symptom is due to the accumulation of dothistromin, which is a toxin produced by the fungus. Symptoms of this disease can be very similar to another pine disease, brown spot needle blight. Austrian pines and ponderosa pines are the most susceptible to damage from this pathogen.

Introduction

Dothistroma needle blight is caused by the fungus Mycosphaerella pini. It is also called “red band disease” because of the red band symptoms (Fig. 1) that are observed on the needles. This pathogen is widespread in forests in western North America, but it will cause the greatest damage on trees planted outside their natural habitat, such as in parks, shelterbelts, and plantations. More than 35 pine species or hybrids are susceptible to infection by Mycosphaerella, with Austrian pines and ponderosa pines being the most susceptible. The fungus releases a toxin, called dothistromin, which moves into the tissue ahead of the fungal hyphae. This toxin is responsible for the red color in the needles. It kills the plant cells, which results in the symptoms typically seen in an infection.

Fig. 2. Needles will die back to the lesion and break off. These needles can resemble a cigarette because the tips may have a gray or ashy appearance.

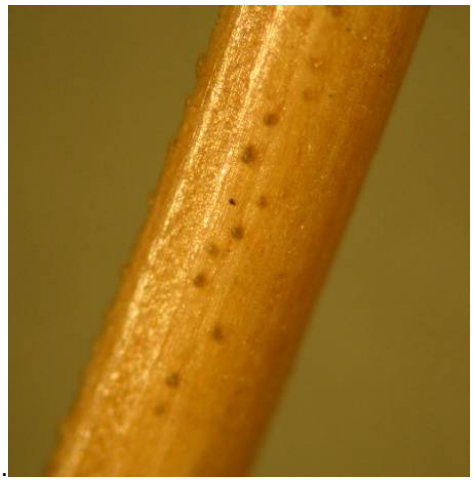

Fig. 3. Stromata under the epidermis of the needle that will emerge soon, dispersing spores for new infections.

Symptoms

Symptoms of Dothistroma blight are very similar to another pine disease, brown spot needle blight, which is also caused by a Mycosphaerella fungal species. Initial symptoms will appear as a water-soaked lesion on the needle. The water-soaking symptoms don’t last very long and are only evident during the initial stages of infection. The lesions will then turn tan, brown, or red and show an abrupt transition from discolored to normal tissue (Fig. 1). This symptom is the “red band” that gives the disease its name and is a more common symptom on trees in the western United States. Occasionally lesions will begin as small yellow to tan spots that will become water-soaked. Needles with discolored lesions can die back to the lesion and break off while the needle bases usually remain green (Fig. 2). Infected needles that break off may resemble a cigarette because the tips can have a gray/ashy appearance.

Older, diseased needles will drop prematurely. Needles on ponderosa pines that become infected in the first growing season will usually have no symptoms until fall and can persist until late summer of the following year. Newly infected second-year needles may drop in the fall or as late as summer of the next year. Within a few weeks after lesion development, small black fungal structures, called stromata, will break through the epidermis of the dead parts of the needle, either singly or in groups (Fig. 3). These stromata produce conidia, or spores, which will emerge during wet weather. The spores will be dispersed and cause new infections on healthy trees. Strong light can enhance symptoms caused by the toxin while shade can suppress them. Severe defoliation can result in death of the tree, although a reduction in growth is the most immediate effect on infected trees. Younger trees that are less than ten years old are more susceptible than older trees.

Disease Cycle

Dothistroma needle blight most often has only one disease cycle each year, although secondary cycles can occur in areas with a mild, moist climate. First-year needles are typically infected beginning in mid-summer. Second-year needles and older needles can become infected from May to October. After the first year the disease has occurred, lesions in all stages of development and sporulation can be found throughout the growing season. The interval from infection to when symptoms appear can vary from four weeks to six months, depending on environmental conditions and host. It is typically shorter in the spring and longer in the winter. Stromata will mature and begin producing conidia in the spring. The conidia are exposed as the stromata push through the epidermis, rupturing it. They are then dispersed by wind or rain and start new infections.

Diagnosis

To be sure that Dothistroma needle blight is the problem in your tree, symptomatic plants can be sampled and checked for the presence of the fungus. Your local county Extension agent may be able to do this for you as they often can provide diagnoses quickly and accurately. If confirmation is desired, the sample may be sent to the diagnostic laboratory. To do this, collect several branches exhibiting symptoms of infection. Plant tissues should be sealed in a plastic bag and sent to the: Utah Plant Pest Diagnostic Lab, Department of Biology, 5305 Old Main Hill, Logan, UT 84322. Care should be taken not to expose the bag to excessive heat or cold so that the specimen and pathogen remain alive until the sample is received.

General instructions for sample collection and shipment can be found at: http://utahpests.usu.edu/uppdl/htm/forms and directing your browser to the diagnostic laboratory sample submission information.

Fig. 4. The tree may produce resin, or sap, as a defense mechanism to inhibit fungal growth.

Resistant Varieties

There are no species of pine that are completely resistant and resistance will vary greatly among the same species. One proposed mechanism of resistance involves the plant inhibiting fungal growth by producing fatty acids and resin, or sap, on the surface of needles (Fig. 4). As a result, infected needles may produce a lot of sap in response to the infection. Some seed from Austrian and ponderosa pines have been found that have a useful degree of resistance and have been used for plantings in the Great Plains.

Management

There are some cultural methods that can be used to lessen disease severity. The disease is typically worse in the lower crown area of the tree where air circulation is poor. Pruning the lower branches and spacing trees adequately will increase air circulation and can reduce disease severity. Clean up and dispose of any debris from around the infected trees, including dead needles and fallen limbs.

In some cases, managing Dothistroma needle blight with chemicals has proven feasible. Although there haven't been any studies in the west, in the central United States two applications of copper fungicides have prevented infection of needles. An application in May and one in June has been shown to protect both first and second-year needles from infection on Austrian and ponderosa pine.

As with other diseases, ultimate control will be achieved through the use of resistant trees.

References

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