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Diagnosing Plant Problems

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ABSTRACT

Diagnosing Christmas tree problems can be a challenge, requiring a basic knowledge of plant culture and physiology, the effect of environmental influences on plant health, and the ability to identify the possible causes of plant problems. Developing a solution or remedy to the problem depends on a proper diagnosis, a process that requires recognition of a problem and determination of the cause or causes.

KEYWORDS

disease symptoms, biotic, abiotic

Symptom Recognition

Before a grower can recognize symptoms, he or she must be familiar with the “normal” characteristics for the particular tree species and varieties grown. Characteristics such as unusual growth habit or needle color may be mistaken for disease symptoms unless the grower knows these characteristics are typical for that variety.

The first step in diagnosing a plant health problem is the recognition of *symptoms*. A symptom is any visible, “abnormal” condition of a plant caused by living organisms, such as fungi, insects, bacteria, or viruses, or non-living agents, such as environmental factors, chemical damage, or physical injury. Common symptoms of tree diseases and disorders include needle blights, chlorosis (yellowing), necrosis (browning), stunting, tip dieback, distorted growth, galls, needle drop, stem cankers (dark, usually sunken areas), wilt, and root rot, to name just a few.

Is There a Pattern to the Symptoms?

After noting the symptoms, make a general assessment of the affected tree(s) and nearby healthy trees. A series of questions may be helpful in assessing the problem: Is more than one plant affected and is more than one type of plant (genera or species) affected? Where on the tree(s) did the symptoms first appear? Is the problem limited to the interior or exterior portions of the tree (or plantation)? Are the symptoms localized or widespread? Are several types of symptoms pres-

ent? Is there a pattern of the affected plants in the plantation (rows, low areas, every nth plant)?

After making a general assessment, take a close look at the symptoms. Are fruiting bodies (fungal structures) visible in the discolored needles or cankered areas? What does the transition zone (border between healthy and “diseased” tissue) look like? Is a sharp line of discoloration between healthy and “diseased” tissue visible? Is there evidence of insect feeding? Is pitch evident? Whenever possible, check the roots. Tip dieback, needle browning, wilting, and what appear to be nutrient deficiencies are symptoms often associated with root rots.

If more than one genera of tree is affected, the cause is often due to an *abiotic* (non-living) agent. If the symptoms are limited to a single tree type, the problem is more likely to be caused by a *biotic* (living) agent—a pathogen or insect. Bear in mind, however, that a particular species of tree may be more or less sensitive to chemical or environmental problems, such as inappropriate use of fertilizers and pesticides, or drought.

Non-living agents are the most likely cause of symptoms appearing on only one side of a tree or planting, or in a repeated pattern, such as every 2 plants or every other row. Symptoms caused by living agents are more likely to be random in occurrence or pattern.

Are Signs Visible?

Signs are the actual visible evidence of fungi and/or insect pests. A 12X to 15X magnifying lens is helpful for viewing fungal structures and insects or mites. Examine the symptomatic plants for fungal fruiting bodies (black or brown pinpoint-size structures) embedded in the tissues (in leaf spots or cankered areas) or fungal growth (molds or strand-like growths).

Signs of insects include the insect itself in any of its life stages, cast exoskeletons (skins), webbing (spider mites), droppings (frass or honeydew), or sooty mold. Finding evidence of a pathogen or insect may not lead directly to the cause of the problem, however. Sometimes non-living factors

can weaken a plant and predispose it to attack by pathogens and/or insects. For example, drought can predispose plants to root rot fungi, such as *Armillaria* spp., to fungal tip blights, such as those caused by *Diplodia* spp., or insect attack.

How Quickly Did the Symptoms Appear?

Another important perspective to consider is the time frame during which symptoms appeared. A record of the environmental conditions just prior to and during the time symptoms appeared may also be useful in determining the cause or causes of the problem.

When did the symptoms first occur? This is often a difficult question, as many problems seem to appear overnight. Symptoms caused by most living agents take several days, weeks, or longer to develop. Non-living agents are usually the cause of symptoms that appear suddenly (1 or 2 days).

Record-keeping

Keeping weekly records of general plant health will help pinpoint the appearance and track the progression of symptoms. Records are also helpful when trying to determine if particular management or cultural practices themselves may have caused the symptoms. It is important to keep records of the dates and rates of fertilizer and pesticide applications, along with notes about environmental conditions when the applications were made. In addition, keep records of new plantings (dates and source), as new trees may serve as the source of pathogens or insects.

Note any changes in the surrounding environment: Are the problem trees located in a windy or frost-prone site? Have there been extremes of moisture (drought/flood)? Questions such as these will help determine if the problem is caused by environmental factors.

Diagnostic Testing

Once you’ve noted a problem and identified potential causes, you may want to submit plants to a diagnostic laboratory for confirmation or further identification. When sending samples to a

lab for diagnostic testing, follow these steps to ensure an accurate and timely diagnosis:

- ∴ Include as much information as possible about the history of the problem (when symptoms were first noted, rate of progression, and any visible pattern to the symptoms, percentage of crop or plants affected).
- ∴ Provide information on pesticide and fertilizer applications, and any changes in the growing environment.
- ∴ Be sure to include the name and variety of the trees. Be sure to include a healthy sample for comparison purposes. If sending samples by mail, package the sample with packing material to avoid shifting during shipment and mail the package early in the week or by overnight delivery to avoid spoilage.

Every state has a diagnostic lab affiliated with their Land Grant University (and usually cooperative Extension). To find the diagnostic lab in your state, go to URL: <http://www.npdn.org>.

Solutions to the Problems

The best approach is to prevent problems in the first place. This may seem obvious; but many simple practices that can prevent plant health problems are often overlooked.

- ∴ Good sanitation is the best prevention and control for problems resulting from disease-causing microorganisms and many insects.
- ∴ Inspect all plant material before planting. Don't plant trees that show symptoms of any kind. You don't want to inherit a problem.
- ∴ Sanitize cutting, planting, and pruning tools before each use. Any plant tissues infected with disease-causing microorganisms can serve as a source of infection for nearby plants. Infected shoots or stems should be pruned and destroyed. If a large portion of the plant is infected, it is better to remove the entire plant. Prune infected trees last. When pruning infected trees and shrubs, sanitize the cutting tools

between each cut (10% bleach or 70% alcohol) and destroy the prunings.

- ∴ Be sure plants are planted properly. J-rooted plants are more susceptible to Armillaria root rot and canker diseases.
- ∴ Seedling trays and pots should be sanitized before reusing. (It is best to use new).

Water, light, and proper nutrition are also key factors to monitor and adjust when necessary to avoid stressing plants. Remember, plants under stress are usually more susceptible to attack by both disease-causing organisms and insects.

Diagnosing plant problems can be both frustrating and rewarding. It is helpful and, at times, necessary to have a collection of reference sources, including plant disease and insect identification guides, to aid in the diagnosis. As with any other skill, the more you practice, the better refined your skills will become. Remember, you can always send samples to a diagnostic lab for confirmation before choosing a management practice, so don't be afraid to hone your own diagnostic skills.