



## DIAGNOSING PLANT PROBLEMS

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### Diagnosing Plant Problems

Diagnosing plant problems can be challenging, 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.

#### Symptom recognition

Before a grower can recognize symptoms, he or she must be familiar with the 'normal' characteristics for the particular species and varieties grown. Characteristics such as growth habit, unusual needle color, and time of needle drop 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 Christmas tree diseases and disorders include needle blights, chlorosis (yellowing), necrosis (browning), stunting, dieback, distorted growth, galls, needle drop, stem cankers (dark, usually sunken areas), wilt and root rot, to name a few.

#### Is there a pattern to the symptoms?

After noting the symptoms, make a general assessment of the affected plant(s) and nearby healthy plants. 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 plant(s) did the symptoms first appear? Is the problem limited to the interior or exterior portions of the plant (or planting)? Are the symptoms localized or widespread? Are several types of symptoms present?

After making a general assessment, take a close look at the symptoms. Are fruiting bodies visible in the discolored needles? What does the transition zone (border between healthy & 'diseased' tissue) look like? (maybe there's evidence of insect feeding). Is a sharp line of discoloration between healthy and 'diseased' tissue visible? Is pitching 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 plant is affected, the cause is usually due to an *abiotic* (nonliving) agent. If the symptoms are limited to a single plant type, the problem is more likely to be caused by a living agent – a pathogen or insect. However, bear in mind that a particular species of plant 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 plant or planting, or in a repeated pattern, such as every two 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 15x or 20x 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) 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*, or to fungal tip blights or insect attacks.

### **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 during that time period 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 or longer to develop. Non-living agents usually cause the sudden appearance (one or two days) of symptoms.

### **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 and the planting of new trees that may be the source of diseases 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 plants 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 plant. 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.

Forms for submitting plant samples to the University of New Hampshire Plant Diagnostic Laboratory can be downloaded at this Internet address:

<http://ceinfo.unh.edu/Agric/AGPDTS/PDform.pdf>

To learn more about the Plant Diagnostic Lab, go here:

<http://ceinfo.unh.edu/Agric/AGPDTS/PlantH.htm>

For instructions on how to take and submit samples go here:

<http://ceinfo.unh.edu/Agric/AGPDTS/pdsubmit.htm>

### **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 caused by disease-causing microorganisms and many insects.

- Inspect all plant material before purchase. 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. 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.

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.