



Diagnosing Plant Problems

Cheryl A. Smith

Professor & Plant Health Specialist

UNH Cooperative Extension

Diagnosing plant problems can be challenging. It requires a basic knowledge of plant culture and physiology, how environmental factors influence plant health and the ability to identify the possible causes of plant problems. Developing the best solution or remedy for the problem depends on a proper diagnosis, a process that first requires recognition of a problem, then determination of the cause or causes of the problem.

Symptom recognition

Before you can recognize symptoms, you must be familiar with the ‘normal’ characteristics for a particular variety. Characteristics such as dwarf growth habit, or variegated, mottled or puckered leaves may be mistaken for disease symptoms unless the observer knows these characteristics are normal for that plant 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, bacteria, viruses and insects; or non-living agents, such as environmental factors, chemical or physical injury. Some common symptoms of plant diseases and disorders include **leaf spots**, **chlorosis** (yellowing), **necrosis** (browning), **stunting**, **dieback**, **distorted growth**, **galls**, **leaf drop**, **stem cankers**, **wilt** and **root rot**. It’s important to realize that any of these symptoms may be caused by multiple factors.

Look at the whole picture.

Is there a pattern to the symptoms?

After noting the symptoms, make a general assessment of the crop and the affected plant(s). A series of questions may be helpful in assessing the problem (and are certainly needed if samples are sent to a diagnostic lab): What percentage of the crop is affected? Is there a pattern to the symptomatic plants in the crop (localized, random or regular)? A regular or repeating pattern is usually associated with abiotic or environmental factors. Is more than one type of plant (genera or species) affected? Pathogens are usually fairly limited in the range of host plants they can attack. Where on the plant(s) did the symptoms first appear (older or younger leaves, inner or outer leaves, etc)? Age-limited symptoms may be due to fertility problems. One-sided symptoms are usually due to chemical injury or environmental factors. Is the problem limited to the interior or exterior portions of the plant (or planting)? Are several types of symptoms present?

After making a general assessment, take a close look at the symptoms. It is often helpful to determine the shape and pattern of leaf spots: Do they have concentric rings or a target appearance? Are the spots round or angular? Do the spots/lesions appear to be limited by the veins? Angular leaf spots (limited by the major veins) are often associated with bacterial infections, downy mildew, or possibly foliar nematodes. Whenever possible, check the roots. Marginal necrosis of leaves, wilting, and what appear to be nutrient deficiencies are symptoms often associated with root and crown rots.

If more than one species of plant is affected, the cause is usually due to an *abiotic* (nonliving) agent. If the symptoms are limited to a single plant species, the problem is more likely to be caused by a living agent – a pathogen or insect. However, bear in mind that a particular species or cultivar of plant may be more or less sensitive to chemical injury from fertilizers and pesticides. 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 visible evidence of fungi and insect pests. A 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) 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. Eggs may even be visible (for example, spider mite eggs are round spheres). 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, excessive fertilizer can predispose plants to root rot fungi.

How quickly did the symptoms appear?

Another important perspective to consider is the time frame over which symptoms appeared. When did the symptoms first occur? This is often a difficult question, particularly if scouting or observation of the planting is not done on a regularly. Often, many problems seem to ‘appear overnight’. Symptoms caused by most living agents take several days or longer to develop. As always, there are a few exceptions; bacterial diseases can develop and spread rapidly, but not ‘overnight’. Non-living agents usually cause the sudden (in one or two days) appearance of symptoms. Symptoms caused by misapplied chemicals often appear within 24 to 48 hours after the application.

Take a tour of your plantings/crops every day, if possible. A week is the longest recommended interval between assessments. Growers and consultants/advisors who inspect their plants regularly are much more likely to pinpoint when a problem emerges and be able to track its progress and implement timely management.

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 as well as the environmental conditions at the time of application. Record when and what new plant material was introduced, it may provide useful information on the potential source of introduced diseases or insect pests.

Note the surrounding environment. A record of the environmental conditions prior to the appearance of symptoms may also be helpful in determining the cause or causes of the problem. For outdoor production or plantings, questions such as, is the planting located in a windy or frost-prone site? Has any construction or painting taken place nearby? Have there been extremes of moisture (drought/flood), or changes in light intensity? 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 the steps below to ensure an accurate and timely diagnosis. Be sure to include as much information as possible about the history of the problem (when symptoms were first noted, rate of progression, any visible pattern to the symptoms [in the planting or on individual plants] and percentage of crop or plants affected).

- Provide a good description of the problem, symptoms & when they were first noticed, percent of crop or plant affected...
- Provide information on pesticide and fertilizer applications, and any significant changes in the growing environment or media. (This is often a key to an accurate diagnosis)
- Be sure to include the name and variety of the plant. It is helpful to try and select a plant that shows the transition zone between healthy and 'diseases' tissues. Also include a healthy plant 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. When practical, it is best to submit whole plants (wrap roots, especially those with soil, to avoid contamination of the foliage).

[The form for submitting plants to the UNH Plant Diagnostic Laboratory can be downloaded at this Internet address: <http://extension.unh.edu/Agric/AGPDTS/PlantH.htm> (scroll to 'Forms').

Or UNH-PDL forms can be obtained by calling: 603-862-3200]

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.