Virginia Cooperative Extension
Virginia Tech • Virginia State University

Publication 426-714

Diagnosing Plant Problems

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Introduction

Something is wrong with your plant. What's the cause? You can begin to determine the cause of the problem by taking on the role of Sherlock Holmes – be a keen observer and ask many questions. Diagnosing plant problems is often a difficult task. There can be many different causes for a given symptom, not all of them related to insects or diseases. The health of a plant may be affected by soil nutrition and texture, weather conditions, quantity of light, other environmental and cultural conditions, and animals, including humans. Complicating this scenario is the fact that any two of the above factors can interact to give rise to a problem. For example, a prolonged period of drought may weaken plants so that they are more susceptible to pests; this is typically observed with boxwoods.

The most effective approach is to know what questions to ask to narrow down the possibilities. For example, you need to consider recent rainfall and the fertilization schedule if you notice brown, dry edges on the leaves of your plants since both dry weather and excess fertilizer can cause such damage. In another example, either excessively dry soil or waterlogged soil can cause the same plant reaction: wilt. Even insect damage can sometimes be confused with plant diseases caused by microorganisms.

First Questions to Ask

To determine what is wrong with a plant, one should first investigate the history of the plant. These questions will help you narrow down the cause of the problem:

Q: How long has the plant been in its current location?

A: If the plant has been transplanted recently, the problem may be associated with the transplan ing operation or post-transplant conditions. You will also want to find out if the plant was planted as a container-grown plant or a ball and burlap (B&B) plant. A recently transplanted container-grown plant will require frequent irrigation during the warm portions of the year. Thus, poor health may be related to the need for water. In the case of a B&B plant, poor health may be related to the shock of root severance, species-related reaction to the B&B harvest, or the time of harvesting or planting.

Plants that have been recently transplanted are not "established." Being established implies that there has been appreciable root growth from the root ball into the adjacent soil. When the plant is not established, it relies solely on the relatively limited water supply available in the root ball. Being established also implies that the plant has acclimated to the above and below ground environmental conditions. Such conditions are in direct contrast to those relatively "lush" conditions of a production nursery. Plants that are not established are reliant on frequent irrigation and are less cold hardy than established plants. While there are no data to support this hardiness contention, I have noticed this phenomenon and over the years have had fellow plant people agree with this observation. Thus, a recently transplanted plant may be affected by low winter temperatures while a nearby established plant of the same species may be undamaged.

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Produced by Virginia Cooperative Extension, Virginia Tech, 2018

VT/1018/426-714

Q: What has been done to the plant or near the plant?

A: Has any construction, spraying, fertilizing, or any other operation taken place in the past? I was once asked about the demise of a relatively large yew plant in a neighbor's garden. The plant was unthrifty and I asked about the history, but nothing significant was reported. Soil and plant analysis did not yield any clues. However, after digging around the plant, it was determined that roots were not getting enough oxygen because three years ago excavated soil from a nearby water garden project was dumped on top of the soil around the yew. The dead needle/branch symptoms were slow to develop and these symptoms were not associated with soil being piled onto the root system. In this case, the reason for plant damage was a lack of oxygen supply to roots, but the true cause and culprit was the homeowner. Thus, try to find out about anything that was done in the vicinity of the plant in question in the year or years prior to the appearance of symptoms.

Q: What are or were the prevailing weather conditions?

A: In many cases uncharacteristically warm, cold, dry, or wet weather can result in plant problems. Unusually warm spells in the spring followed by very low temperatures can damage or kill many plants. Plants that leaf out early such as Japanese maples are most vulnerable. In some cases, unusually mild weather during the fall will promote lush growth that has not hardened off and therefore has not started to acclimatize to low temperature conditions. This lush foliage will then be damaged by the first exposure to relatively low temperatures. Relatively fast-growing plants and those that have an indeterminate growth habit (shoot growth continues through the growing season) are especially prone to such cold damage. Unusually dry weather in any season will bring on drought symptoms (wilting, leaf and branch death). But there may be an interaction of weather conditions and season. Years ago, there was an especially dry fall and winter which resulted in significant damage to landscape and field-grown (nursery-produced) broadleaved evergreens. Thus, evergreen plants such as southern magnolia and boxwood, species which transpire (lose water vapor from leaves) during most of the year, were severely damaged due to the interacting conditions of low soil moisture and low winter temperatures/dry air.

Causes of Plant Damage

Factors causing plant damage can be grouped into two major categories, living and nonliving factors. Living factors include pests (e.g., insects, mites, rodents, rabbits, deer, humans) and pathogens (e.g., disease-causing microorganisms, including fungi, bacteria, viruses, nematodes). Nonliving factors include mechanical factors (e.g., breakage, abrasions), environmental factors (e.g., temperature, light, moisture, oxygen, lightning, wind), and chemical factors (e.g., fertilizer or pesticide excess, nutritional disorders).

Use a Systematic Approach

Define the problem. Closely examine the entire plant and others around it. Take note of all the symptoms. For example, if the plant has insects, examine the leaves with insects on them; do they have brown spots, holes, chewed edges? Are they turning pale green or yellow? Is there more than one kind of insect present?

Look for patterns. Do other plants have the same problem? Are they all in the same place or in different locations? Are they all the same type of plant? Damage to all different types of plants in a particular spot can indicate nonliving factors. Damage to a few species of plants or only to plants of the same species can indicate living factors.

Observe where the damage occurs on a plant. Are the symptoms exhibited throughout the plant or are they localized? For example, when the tops of plants wilt or die, one can generally infer that there is a problem with the root system. When the root systems of shrubs and trees are adversely affected by either too much or too little water, soil compaction, or root damage from construction activities, the damage generally shows up in the top or growing points.

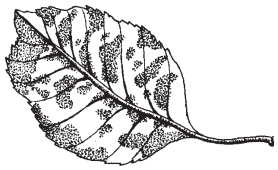
Examine the spread of the problem. Is the problem spreading gradually? This can indicate living factors. If the problem occurred suddenly and remains in a particular spot or on a particular plant, this points toward nonliving factors. There are, however, diseases that can kill a plant within a short period of time, although this is not common.

Determine likely cause of damage. Based on the pattern and spread, decide if the problem is more likely caused by living factors or nonliving factors. If living, is the problem a pathogen or a pest?

Living Factors

If disease is a possibility, check the following general guidelines for identifying the different causes of disease:

A **fungal pathogen** often causes round leaf spots, stem rots with a dry/papery texture, concentric rings, discoloration, or wilt. Fruiting structures (sometimes microscopic) may form on affected tissue.



A **bacterial disease** can take the form of galls (swollen areas), irregularly shaped leaf spots, wilting (then yellowing and dying), or rot (often a wet rot).

A **viral pathogen** can inhibit chlorophyll formation, causing degrees of yellowing or mottling, stunting, distortion, or dieback of part of the plant. Viruses usually debilitate rather than kill, as they are parasitic.

Nematodes are microscopic roundworms that cause disease-like symptoms. Stem nematodes feed on stems and cause shortening of internodes. Root nematodes feed underground, damaging the root system; this leads to moisture and nutrient stress which shows up as wilting and stunting. Foliar nematodes cause angular leaf spots.

If an insect problem seems likely, check the following:

A **chewing/rasping** insect feeds on plant tissue and can cause ragged/chewed or missing leaves (e.g., caterpillars, slugs, beetles, grasshoppers), rolled leaves (leafroller), tunnels in between upper and lower leaf surfaces (leaf miners). They can also cause holes in stems, branches or trunk, sections of tree dying, or premature yellowing (wood borers); girdled or dead stems (cutworms, twig girdlers, or stem borers); or general decline of plants due to root damage (soil-dwelling insects)

A **sucking** insect feeds on plant fluids and injects toxins into the plant. The toxins can cause leaf spotting or stippling (e.g., aphids, leafhoppers, spider mites), leaf distortion such as curling or puckering (or more commonly this can be damage from leafhoppers and thrips), or poisoning of entire plants, resulting in stunted growth and/or yellowing (e.g., scale, mealybugs, mites, aphids, whitefly).

Nonliving Factors

Damage caused by **mechanical factors** is usually revealed by close visual examination; check for broken or girdled stems or roots, also bruised, punctured, or broken leaves. Damage to the base of a tree trunk is often caused by weed trimmer or mower damage.

Damage due to **physical factors** often results from environmental extremes. Cold damage is characterized by death of exposed foliage. Container plants are susceptible to cold damage to the root system, characterized by blackened or spongy roots with lack of new growth or root hairs, usually near the container edge.

A rapid change from low **light** to high light intensity, or vice versa, can cause yellowing of leaves, reduced growth, and leaf drop or death. Too little light can reduce, delay, or prevent flowering and will also result in very lanky, sparse growth.

Excess **heat** usually causes scorch symptoms on leaf tips and interveinal areas. Portions of leaves shaded by other leaves, or leaves on the shady side of the plant, may be undamaged. Frequently, heat damage will occur uniformly over all plants in an affected area.

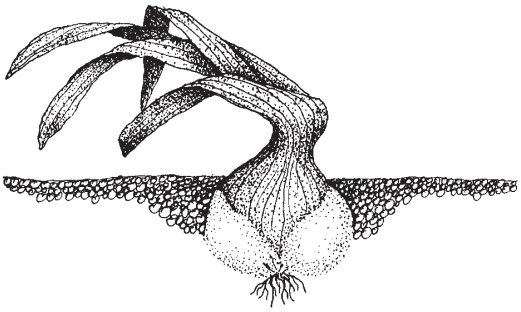
Drought and waterlogging produce many of the same symptoms on the aboveground parts of the plant, mainly chlorosis (yellowing leaves), abscission (shedding older leaves), and wilt. Waterlogging of the root zone also results in oxygen deficiency, leading to a halt in root growth and metabolism, death of the roots, and wilt.

Damage due to **chemical factors**, inappropriately used pesticides or excessive rates of pesticides, can cause

symptoms, such as leaf burn, distortion, chlorosis, or bleaching, depending on the chemical. On a field basis, pesticide or fertilizer damage symptoms frequently are associated with application patterns.

Nutrient deficiencies show up as yellowing, stunting, or death of older plant leaves or new growth, depending on the missing nutrients.

Refer to expert information. Talk to your Extension agent or to local garden center personnel, explaining the symptoms thoroughly, or check all the symptoms against a good chart or reference book, keeping in mind the factor you have determined as the likely cause. If it appears insects or pathogens are causing the problem, be sure to positively identify the pest so you can choose the most effective control measure.



Double-check the Obvious

It never hurts to look again for obvious problems. Is the stem/trunk badly damaged? Has the plant been sitting in a saucer of water for a week? Has your neighbor sprayed an herbicide lately? Does your cat enjoy fern salad? Is your dog deprived of fire hydrants? Do your children "help" you by cleaning the plants with furniture polish or window cleaner?

For more information on plant selection, planting, cultural practices, and environmental quality, contact your local Virginia Cooperative Extension office. If you want to learn more about horticulture through training and volunteer work, ask your Extension agent about becoming a Master Gardener. For monthly gardening information, subscribe to The Virginia Gardener Newsletter by sending your name and address and a check for $5.00 made out to "Treasurer, Virginia Tech" to The Virginia Gardener, Department of Horticulture (0349), Virginia Tech, Blacksburg, VA 24061. Horticultural information is also available at Virginia Cooperative Extension's website, *www.ext.vt.edu*.

This publication was originally authored by Diane Relf, Extension Specialist (ret.), Environmental Horticulture, Virginia Tech, and the original development of this series was funded by ESUSDA Smith Lever 3(d) National Water Quality Initiative Funds and the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.