



Plant Diagnostics

What is “wrong” with my plant?

Being a good detective is the key to your success in addressing these questions. You need excellent observation skills to collect all the facts for proper identification of issue and causal agent. Maintain an open mind that considers multiple issues or causal factors. Without proper identification of the issue and the agent causing the issue, management measures can waste time and money and to lead further plant loss. Also acknowledge that if you narrow the issue down to several possibilities that all have the same management measures it is efficient to stop at that point. When continuing on for a more specific identification does not change the recommendation there is no need to spend more time on the case.

Use the following steps to guide your observations and fact collection.

Know what is normal to determine if a ‘REAL’ problem exists.

Identify the plant. Note its common and scientific names and when possible the variety or cultivar. Determine the “normal” appearance of this specific plant. Begin a list of diseases, insect pests or other issues associate with the identified plant but do not jump to a final answer too quickly.

Check for symptoms.

Through comparisons between the plant(s) of concern and an understanding of the "normal" appearance identify symptoms (changes in plant growth or appearance in response to one or more damaging factors). Compare characteristics such as overall size, shape, and coloration; leaf shape, size, coloration, and distribution; root distribution and coloration; and bark, stem or trunk texture and coloration. Are symptoms associated with specific plant parts?

Symptoms can be categorized as:

- **Underdevelopment of tissues or organs.** This includes stunting, inadequate development of roots, malformation of leaves, inadequate production pigments, and failure of fruits and flowers to develop.
- **Overdevelopment of tissues or organs.** This includes galls on roots, stems, or leaves, witches' brooms, and profuse flowering.
- **Necrosis or death of plant parts.** This includes shoot or leaf blights, leaf spots, and fruit rots as well as wilts or diebacks of the entire plant.
- **Alteration of normal appearance.** Examples include mosaic patterns of light and dark green on leaves, and altered coloration in leaves and flowers.

Identify host specificity in symptoms. Are the symptoms occurring in only one plant species or are different plant species affected? If different plant species are affected, how closely related are these species and what issue might they have in common. A problem appearing in 100% of the plants might also be associated with poor soil conditions or adverse climatic factors such as cold temperatures or drought.

Observe patterns. Is the damage on the entire plant or certain parts? Is the damage on a certain



age of growth? Is the damage pattern at the community or individual level uniform? A uniform pattern on an individual plant and uniform damage patterns over an affected area are usually due to abiotic (non-living) factors like improper herbicide use.

Determine the time development of symptoms in the plant(s) of concern. If the symptoms all appeared at the same time and there has been no further development of symptoms, this would indicate a possible episodic event such as a change in temperature or possible improper chemical usage. When the symptoms start in one area of the plant and slowly spread to other areas and the severity of symptoms changes over time, this is characteristic of biotic (living factors) such as a disease, insect or mammal.

Consider potential symptom variability in plants and recognize that damage might be the result of primary and secondary symptoms. For example, decayed roots on a tree may be a primary symptom while the toppling over of the tree is a secondary symptom. At later stages of a disease, secondary invaders may also obscure the original disease symptoms.

Check for signs.

Signs are evidence of the damaging factor. For example, mycelia of a fungal agent, fungal spores, and spore-producing bodies are observable evidence of plant disease agents. Indications of insects causing problems may include the actual insect, insect frass, mite webbing, and insect eggs.

Ask lots of questions.

Question the activities that have been conducted around the affected plants by gardeners or managers of neighboring landscapes, including cultural and maintenance activities such as applied amendments, fertilizers, pesticides or other chemicals. Consider information about abiotic environmental factors such as: extreme temperatures (freezing and heat), rainfall, hail, lightning, prolonged drought, temperature inversions (important in possible air pollutant damage and pesticide drift) and prevailing winds. Also evaluate site factors such as soil type, possible drainage problems, and soil pH.

Laboratory Tests

The use of a hand lens and a knife can be valuable for cutting into and inspecting different parts of a plant while dissecting and compound microscopes are useful for inspection of the smallest organisms. For plant diseases, place a sample of the diseased tissue under conditions that will allow an infectious agent to grow and possibly induce sporulation like in a moist chamber with a damp towel. It may be necessary to turn to experts with more specialized skills to assist with final diagnosis.

Insect Diagnostic Laboratory - <http://idl.entomology.cornell.edu/>

Plant Disease Diagnostic Clinic - <http://plantclinic.cornell.edu/>

Cornell soil test guidance - <http://cwmi.css.cornell.edu/GuidanceSoilTesting.pdf>

Final Diagnosis

It is the compilation of the information and clues that will ultimately lead to the most accurate diagnosis. Diagnosis is a form of hypothesis testing, where the hypothesis is simply the identity of the issue generated through observations of the plant, environment, and information from the grower or often by the process of eliminating what it is not. When all of

the information is successfully collected use additional research-based sources to determine what is already known about diseases and disease-causing agents associated with the identified plant. Information can be obtained from many published resources including the fact sheets found on the insect and plant disease web sites listed about as well as those listed below and in compendia or through personal communication with experts. When no information is available on the specific plant, information on insect, diseases and disease causing-agents of similar plants may be useful. There may also be rare cases where no information is available related to the issue. Then, extensive testing may be necessary to determine the identification of the issue and there may be no research-based management recommendations available. Recognize when it is not worth pursuing further.

Tools/Resources for Diagnosis

NYS Integrated Pest Management - <http://www.nysipm.cornell.edu>

The Interactive Plant Manager - http://nysipm.cornell.edu/aes_ornamental.asp

Vegetable MD - <http://vegetablemdonline.ppath.cornell.edu>

The Berry Diagnostic Tool - <http://www.fruit.cornell.edu/berrytool/>

Cornell Crop and Pest Management Guidelines - <http://ipmguidelines.org>

Nutrient Deficiencies http://ipm.missouri.edu/ipm_pubs/ipm1016.pdf

Tomato & Potato Late Blight in the United States <http://usablight.org/>

Tomato MD app

<https://itunes.apple.com/us/app/plant-health-from-aps/id868779103?ls=1&mt=8>

Diseases of Trees and Shrubs by Wayne Sinclair and Howard H. Lyon

Insects that Feed on Trees and Shrubs by Warren T. Johnston and Howard H. Lyon

Turfgrass Problems: Picture Clues and Management Options

Broadleaved Shrubs and Shade Trees: Problems, Picture Clues, and Management

Cornell Cooperative Extension County office contact information at:

http://cce.cornell.edu/learnAbout/Pages/Local_Offices.aspx



Ask an Expert <https://ask.extension.org/ask>

References

Riley, M.B., M.R. Williamson, and O. Maloy. 2002. Plant disease diagnosis. The Plant Health Instructor. DOI: 10.1094/PHI-I-2002-1021-01

Learn More

American Phytopathological Society Education Center - www.apsnet.org/edcenter

Published: April 2015

Author: Lori J. Brewer, Cornell Garden-based Learning, Horticulture, Cornell University

Reviewer: Dr. Elizabeth Lamb, NYS Integrated Pest Management Program

Building Strong and Vibrant New York Communities
Cornell Cooperative Extension provides equal program and employment opportunities.

Contact: www.gardeninfo.cornell.edu/contactus