

How to Make a Sick Plant Talk or Plant Disease Diagnosis for Gardeners



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“So...

what seems to be the problem?”





Important terms

- Symptom
- Sign
- Wilt
- Blight
- Canker
- Chlorosis
- Mosaic
- Necrosis
- Triage
- Hypothesis
- Sampling



Symptom vs. sign

- Symptom
 - Plant – physiological changes to the plant as a result of disease (wilt, chlorosis, fasciation)
- Sign
 - Pathogen – Physical evidence of the causal organism (spores, hyphae, mushrooms, ooze)



Common disease symptoms

- Leaf spots, foliar blights, rusts, and mildews





Leaf Spots, rusts, mildews

Symptoms: spots, chlorosis,
defoliation

Signs: spores, fruiting structures



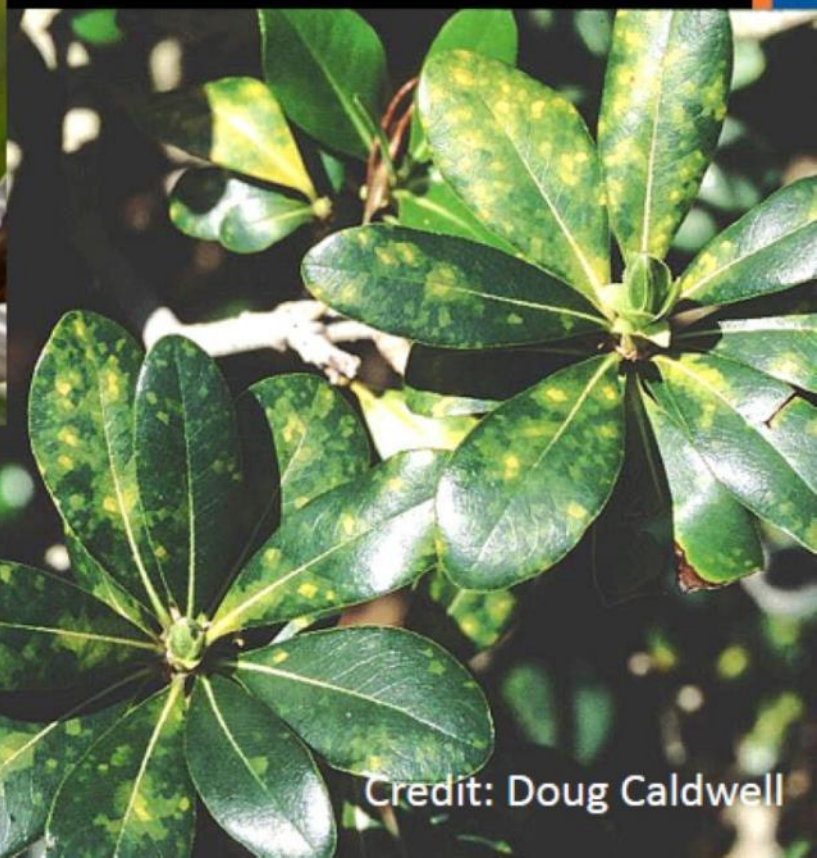
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Fungal leaf spots

Cercospora leaf spot



Crinum lily



Pittosporum

Credit: Doug Caldwell







Frangipani rust



Credit: Stephen Brown

Pustules on leaf of *Eugenia*

Powdery mildew



Credit: Doug Caldwell



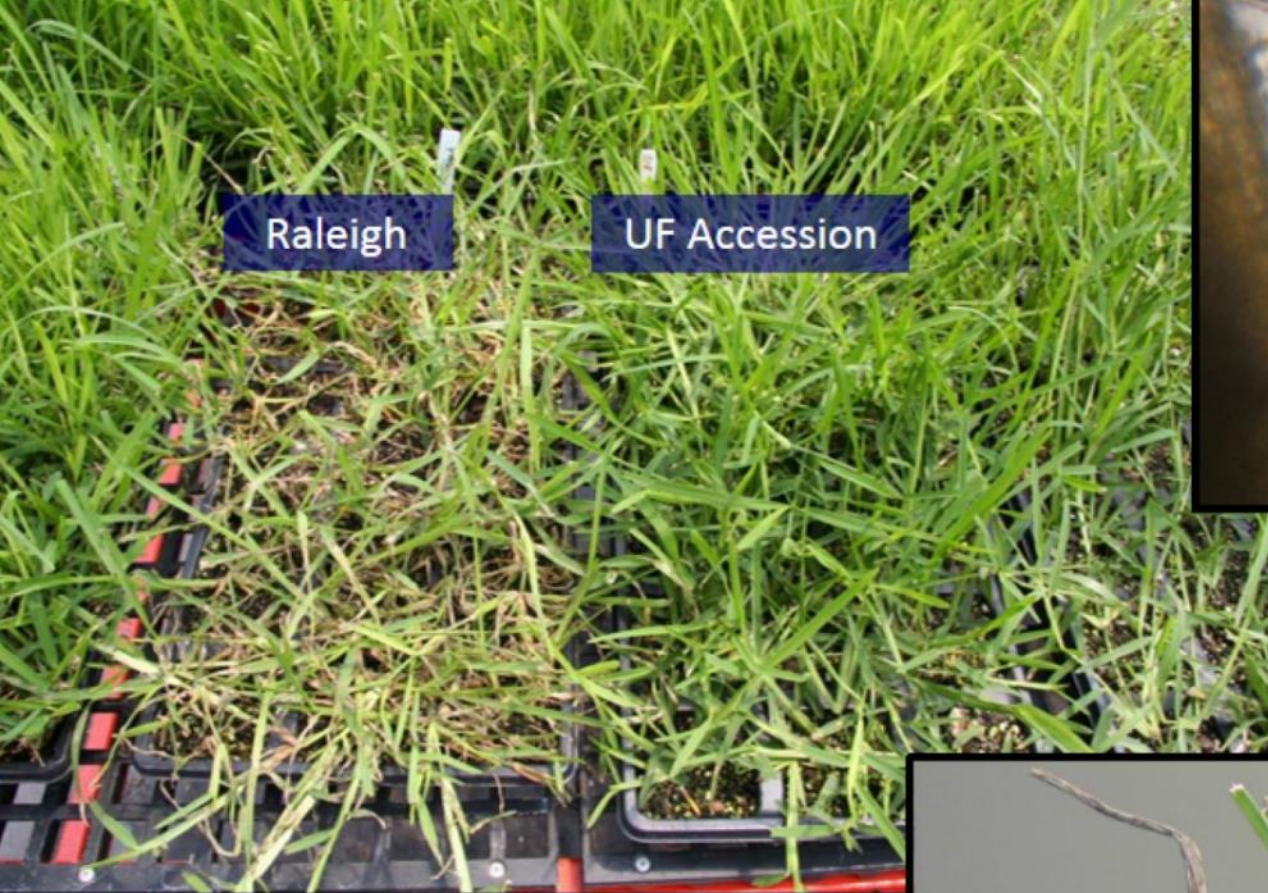
Downy mildew (*Plasmopara viburni*)

← On 'Awabuki' viburnum

↓ On *Coleus*



Credit: PF Harmon



Raleigh

UF Accession



Credit: PF Harmon

Gray leaf spot

On St. Augustinegrass →





white mold



Credit: PF Harmon



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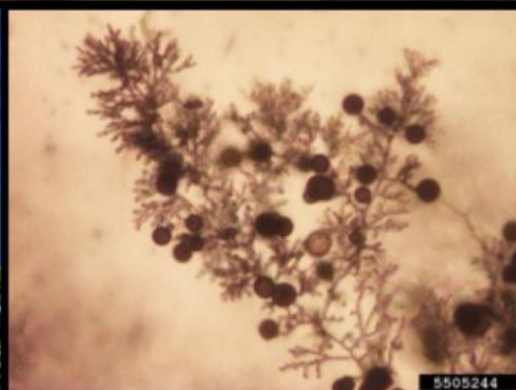


Credit: Bugwood

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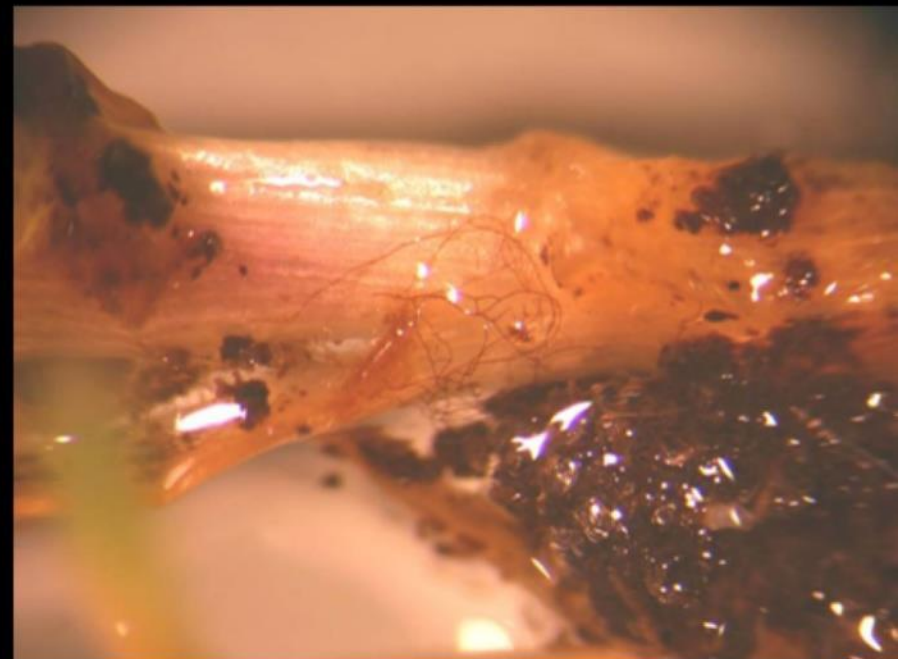


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*Phytophthora
ramorum*



Credit: PF Harmon



Large patch on St. Augustinegrass



Common disease symptoms

- Cankers and diebacks
- Vascular wilts



Nectria canker





Stem Blight, Dieback, Cankers

Symptoms: cankers on woody stems, dieback, wilt, vascular discoloration

Signs: some dieback fungi produce fruiting structures



Credit: PF Harmon

Swollen branches and proliferation of shoots on dahoon holly (*Ilex cassine* L.) infected with *Sphaeropsis tumefaciens*.



Strandberg and Brennan

Dieback from *Sphaeropsis*, note black pycnidia

Image credit: Celeste White



Sphaeropsis tumefaciens



Main types of diseases

- Vascular wilts



Credit: Bugwood

Credit: PF Harmon



Stem canker caused by
Botryosphaeria dothidea

Severe dieback resulting from
stem and bole cankers caused by
Botryosphaeria dothidea



Fusarium oxysporum
on tomato



Credit: Bugwood



Ralsonia solanacearum
on tomato

UGA1234079

UGA1234208



Main types of diseases

- Root rots



Soil borne organisms, usually fungi **cause** root rot.
Abiotic factors also cause root rot—water logged soil.



Root Rots

Symptoms: brown mushy roots,
stunting, wilting, yellowing

Signs: not many



healthy

inoculated

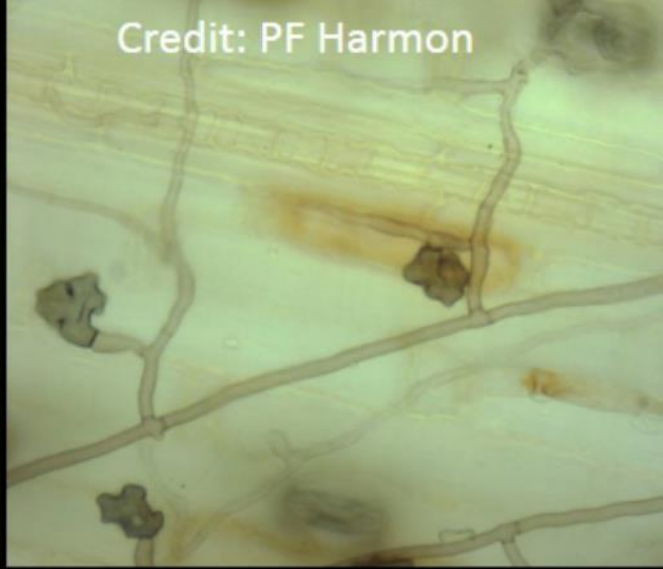


Not Inoculated

Inoculated (note the lack of roots and the black coloration)



Credit: PF Harmon



Take all root rot on St. Augustinegrass



Main types of diseases

- Viral diseases



Photo by W. Witcher

Photo by R.O. Hampton



PEA VIRUS 315 IN PEA
1963-109



Viral Diseases

Symptoms: leaf mottling/mosaic, shortened internodes, stunting

Signs: scanning electron micrograph, inclusion bodies





Unknown ringspot virus
symptoms on *Phalaenopsis*
orchids

Rose mosaic symptoms



Credit: CL Harmon

Quick review



Guidelines for Identification and Management of Plant Disease Problems:
Diagnosing Plant Diseases Caused by Fungi, Bacteria and Viruses



Appropriate samples

- Leaf spot/foliar blight diseases
 - ~10 affected leaves showing a range of symptoms from light disease to very blighted. No dead leaves. Stem tissue from the symptomatic area as well, focusing on areas that have some healthy and some symptomatic tissue.
- Wilt diseases
 - The whole plant is best, or plenty of fresh symptomatic but not dead tissue from the roots, stems, and leaves.
- Turf diseases
 - Cut a patch of the lawn out, including roots, from an area that has some healthy and some affected turf. Wrap sample so soil does not shake off roots in transit.
- Virus diseases
 - New, symptomatic tissue is usually best. Include symptomatic flowers, fruits, whole plant if possible since virus particles accumulate in different tissues depending on the virus. Be sure to note insects if present, since they may not survive the shipment well.

What happens to a sample in a diagnostic lab?

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Diagnosis is hard, but it's not rocket science

- Plants only have so many ways to tell us they're sick (symptoms)
- Plants have needs – fulfill the needs and disease will be the exception, not the rule (right plant, right place)
- Plants don't live forever
- Plants are not plastic (they will never do well in median strips, parking lots, planted in fill dirt, etc.)
- Dead plants tell no tales (crispy twigs or turf are never sufficient for diagnosis)
- A photo is worth a thousand dead plant samples (can't get a good sample, at least get a good picture)

Diagnosis is hard, but it's not rocket science

- What's a good sample? Where the disease is moving (usually the intersection of healthy and sick/dying)
 - Depends on the problem
 - Wilt – need whole plant
 - Dieback – usually stem, back to below the sick part
 - Leaf spot – leaves with a range of symptoms (still not dead, and NOT crispy)
 - Turf patches – dig a small section of sod, 8"x8". Enough soil to keep roots intact and moist.
 - Never add water, always transport quickly
 - Submission information!



Steps to a Good Diagnosis

- Observe the symptoms and read the submission form (gather information)
- Interpret results of tests, combine with information provided by the submitter
- Formulate a diagnosis and communicate
- **ASK QUESTIONS!**

Guidelines for Identification and Management
of Plant Disease Problems: Part IV.
Plant Health Questions to Ask the Client



Ask questions

- What's the plant? (know what normal looks like, what conditions the plant likes)
- What were the growing conditions? (SSICC: sun, soil, irrigation, chemicals, culture)
- What is the submitter worried about? (symptoms, other?)
- What else does the submitter know? (stealth diagnostics – folks often know a lot more than they'll write on a submission form)
- Watch out for red herrings: “a seemingly plausible, though ultimately irrelevant, diversionary tactic, not necessarily consciously misleading”

Use your tools

- Them interwebs - Google is great, Bing not so much, for science. Use trustable sources. UC Extension – yes. GardenersForAGreenerPlant.com, maybe not
- EDIS: type in the plant, the problem, and the acronym EDIS (e.g. tomato wilt edis)
- Your agent and UF specialists – easiest way to find people working on your particular thing? Use EDIS again, and check in with the authors of the relevant pubs
- Got a microscope? Get trained to use it!
- Practice collecting plant samples so you can explain to others

Management recommendations

Homeowner's Guide to Fungicides for Lawn and Landscape Disease Management¹

Philip Harmon and Aaron Palmateer²

Homeowners are generally discouraged from using fungicide products to manage diseases of the lawn and landscape for the following reasons:

- Fungicide products have been developed to help manage specific plant diseases. There is no one product suitable for every situation.
- Correct diagnosis of the disease being treated is necessary to select the appropriate fungicide products. Diagnosing the disease is difficult to do based on visual appearance alone
- Timing (i.e., when and how much) applications to effectively control a disease is a complex task. In many cases, there is a narrow window of time when best performance is likely. It takes experience to recognize that window through close observation of the plant and environment. Reapplication is necessary at intervals that depend on how long the fungicide persists and remains effective. In addition, there is no available curative treatment once symptoms of some diseases have developed. Fungicide applications will help only with preventing spread to other areas in these situations.

- There are specialized skills, equipment, and a certain attention to detail that is required to effectively and measure, dilute, and apply fungicide products.

That being said, many fungicides are packaged for and marketed to homeowners. These products can help manage some lawn and landscape diseases when used appropriately.

What is a disease?

Plants die for many reasons, not all of which are diseases. Many environmental stresses can mimic diseases. A variety of injuries (e.g., mowing the grass too short) or disorders (e.g., nutritional deficiencies, drought) can result in plant death, yet not involve a pathogen. Disease occurs when a pathogen infects a plant and disrupts growth and appearance. This could eventually kill that plant over time. The most common plant pathogens include fungi, bacteria, and viruses.

Disease Triangle

Environmental factors influence disease development in the landscape. When the environment favors the host plant, disease is unlikely to occur. When environmental factors favor growth of the pathogen and infection of the host, disease is more likely to occur. All three sides of the

Professional Disease Management Guide for Ornamental Plants¹

P. F. Harmon and S. D. Bledsoe²

The ornamental plant industry thrives in Florida because of the warm, humid environment that makes Florida a gardener's paradise and a compatible location to mass produce numerous plant species. These ideal conditions also are suitable for the development of a wide variety of plant pathogens, including bacteria, fungi, and viruses. Mild winters in Florida also facilitate survival of some insects that can spread plant pathogens, especially viruses. In addition, Florida serves as a major port of entry for the international trade of ornamental plants. Trade carries the risk of introducing exotic invasive pathogens that could threaten ornamental and agricultural industries in Florida and throughout the United States, so growers are required to follow certain phytosanitary regulations. These challenges require growers to develop the most efficient production plans possible, incorporating as many tactics as they can to maximize plant health and minimize opportunities for pest and disease outbreaks—a concept known as integrated pest management (IPM). This publication is intended to be used by growers, landscape professionals, and other pest control operators as a reference for managing ornamental plant diseases. Management tactics are outlined under the following key components of an IPM program: prevention, cultural control, scouting, physical control, biological control, and chemical control. Tables 1–4 contain important

information about commercial products currently available for the management of ornamental plant diseases. In addition, a list of useful websites and additional resources is available at the end of this document to supplement the information provided.

Disease Prevention

Once symptoms of a disease or pest problem are evident, management can be difficult, costly, or even impossible. Some basic management practices can help prevent pest problems from occurring in the first place. The following precautions can reduce the likelihood of plant disease development and spread.

Exclusion

Exclusion implies that healthy plants or pathogen-free planting media are kept in an isolated area that excludes plant pathogens. Plants are often grown in a nursery or greenhouse where care is taken to ensure that planting stock and media are pathogen free. When ordering seeds, bulbs, or tubers, find out if they are certified to be pathogen free. If possible, purchase planting media that has been pasteurized to kill plant pathogens and pests. All media should be stored in original bags until use or in covered

What do beer and bleach have in common?



Thank you!

- Carrie Lapaire Harmon
- UF Plant Diagnostic Center

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