




Plant Diagnostic Center



How to Make a Sick Plant Talk

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UF-IFAS Plant Diagnostic Center

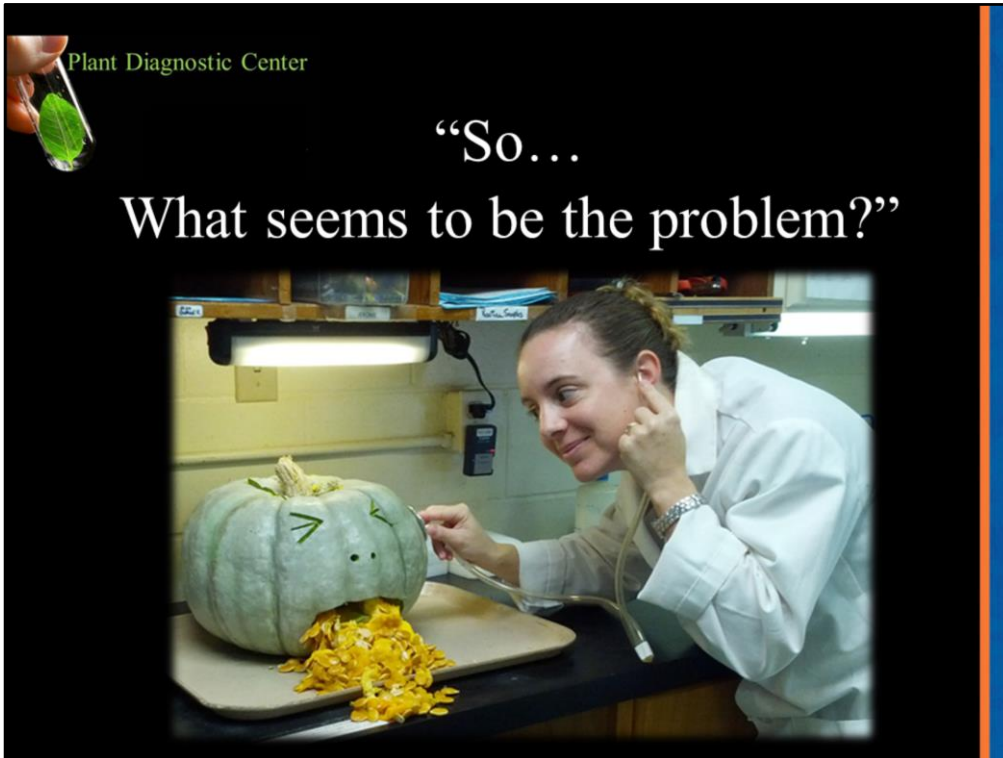


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Important terms

- Symptom
- Sign
- Wilt
- Blight
- Canker
- Chlorosis
- Mosaic
- Necrosis


Important terms for this module include Symptom, Sign, Wilt, Blight, Canker, Chlorosis, Mosaic, Necrosis, Triage, Hypothesis, and Sampling.



sick plant, what are your symptoms

what is the plant disease clinic?

extension plant specialists, here to make you look good!



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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)

The first step in disease detection is noticing something is amiss. To be able to do this, you must know how the plant should look normally. Then we need to make sure we are using the same vocabulary to describe the problem.

Symptom is the plant's side of things, physiological changes to the plant as a result of disease such as wilt, chlorosis, fasciation

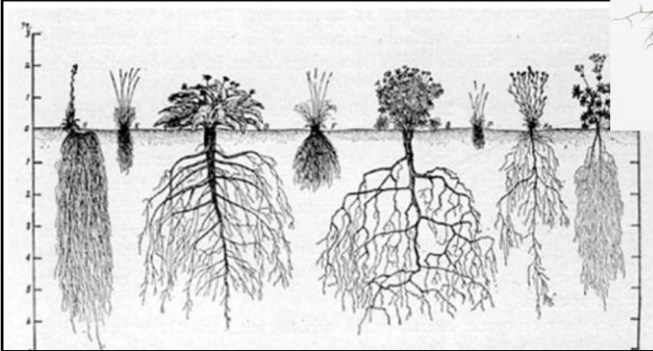
A sign is the pathogen's side of the conversation – Physical evidence of the causal organism (spores



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Where do we find symptoms?

The plant, the whole plant, and nothing but the plant





Leaf Spots and Blights

Symptoms: spots, chlorosis,
defoliation

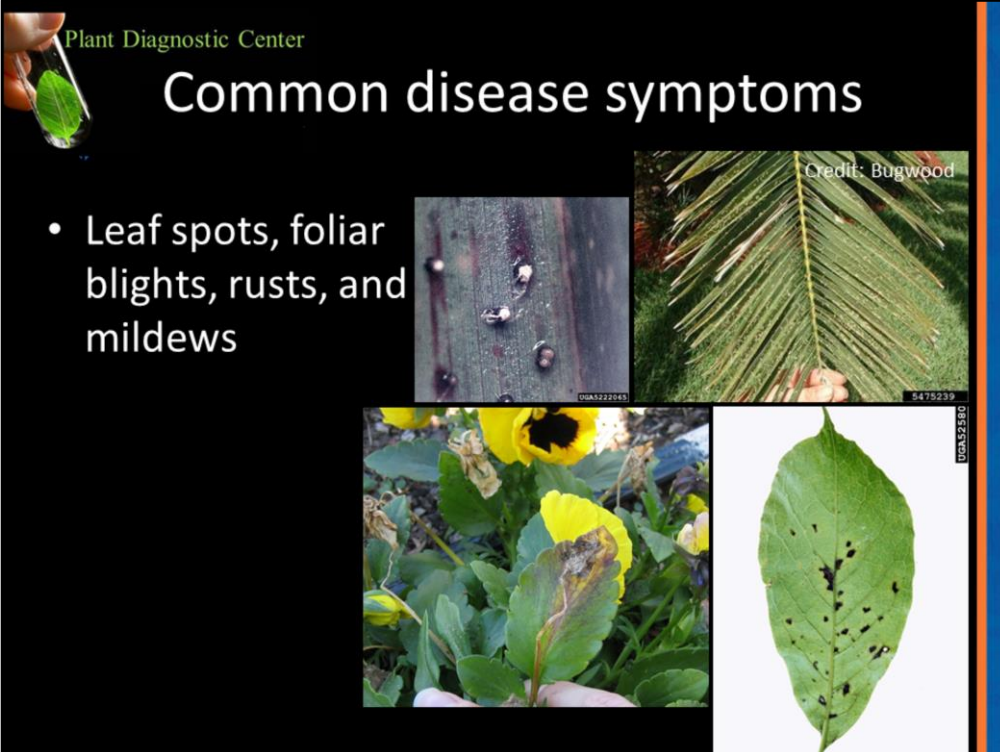
Signs: spores, fruiting structures

Symptoms of leaf spots, rusts, mildews and even blights include spots, chlorosis, defoliation. Signs could include spores and fruiting structures.

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Common disease symptoms

- Leaf spots, foliar blights, rusts, and mildews

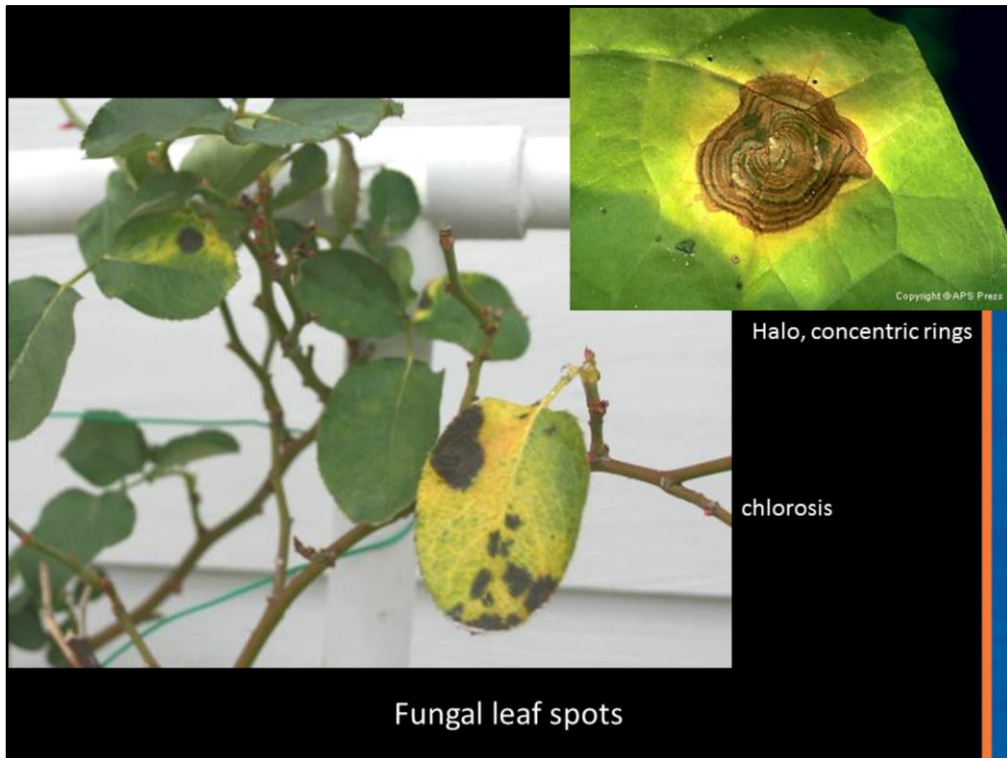


Let's talk about common symptoms – what would you see in the field or landscape that would clue you in to a potential disease problem? What symptoms would you see? What would the signs be?

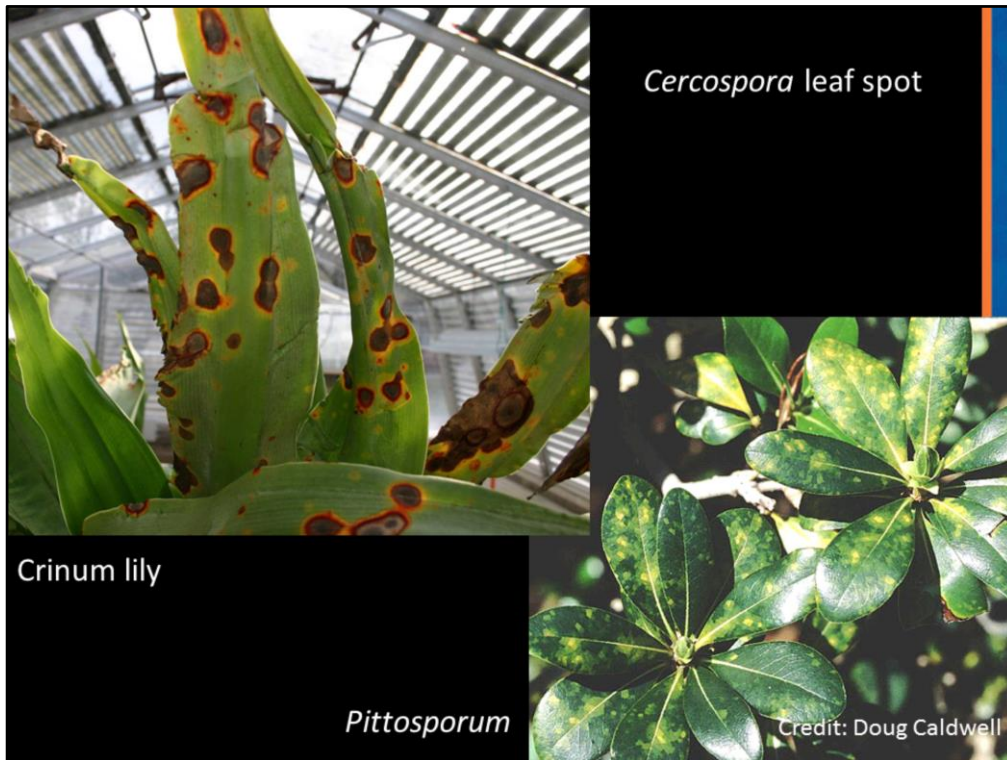
Top images: *Graphiloa phoenicis* on Canary Island date palm (*Phoenix canariensis*)
Bottom images: *Botrytis* on Pansy;



Phytophthora on this vinca started as tip necrosis and progressed to a foliar blight – whole leaves are dead and the disease is progressing down the petiole into the stem.



Black spot of rose caused by *Diplocarpon* on the left, *Alternaria* leafspot on the right. Note that these fungal diseases include chlorosis (on the black spot leaf) and haloes (on the *Alternaria* leafspot leaf).



Cercospora leaf spot of crinum lily and *Pittosporum* produces a striking symptom, but rarely do we see the signs of the pathogen, especially in the field.



Entomosporium leaf spot of indian hawthorn is very distinct and can cause defoliation. You can often see the raised black bumps of the pycnidia in the center of the dark spots.



**Not disease with *Ixora*,
nutritional: potassium &
phosphorous deficiency ,
especially during cool, dry
winters.**

Just to change things up a bit, here is a leaf spot that is not a disease – this leaf spot is caused by a nutritional problem.



Daylily rust causes at first an dark lesion (the symptom), then bright orange pustules. The spores (which are signs) are also orange and can rub off the leaves.



Frangipani rust and rust on *Eugenia* is mostly signs – we don't see much in the way of lesions until the leaves are covered with rust pustules.



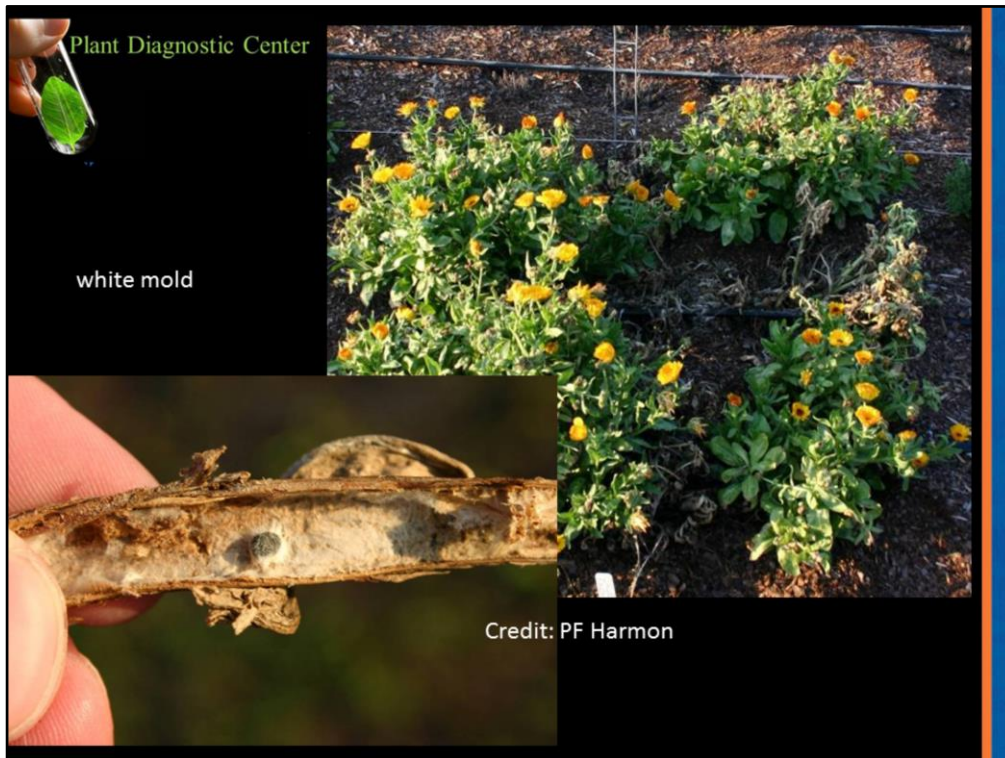
Powdery mildews generally produce white flat growth on diseased plants. The white growth is a sign that consists of both hyphae and spores. This growth tends to be on the upper leaf surface, but not always. As with the rusts, there may not be much in the way of lesions. Chlorosis and defoliation are more common symptoms of powdery mildew.



Downy mildew tends to have its signs on the lower leaf surface, and the symptom can be a faint mosaic or distinct lesions, depending on the specific pathogen and host.



Gray leaf spot of turf is proof that pathologists are very practical in naming our diseases. The gray lesions (symptoms) are actually tan until the spores are produced, turning the lesions gray (sign). Eventually, this disease may become a blight.



White mold may start by killing leaves, but progress to a systemic disease that kills the plant. *Sclerotinia sclerotiorum* produces two distinct signs: large black survival structures in hollow stems of diseased plants are sclerotia; white fluffy cottony growth is also produced by this fungus.



Ramorum blight, caused by *Phytophthora ramorum*, starts as a necrotic tip or spot, then proceeds to blight the entire leaf. It may eventually proceed into the petiole and then the stem, causing wilting and even dieback and death of the plant.

Top images: California laurel; *Rhododendron spp.*

Bottom images: coast live oak; fruiting bodies



Large patch on St. Augustinegrass



Stem Blight, Dieback, Cankers

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

Signs: some dieback fungi produce fruiting structures

Symptoms of stem blights, dieback, and cankers can be cankers on woody stems, dieback, and vascular discoloration. Some dieback fungi do produce fruiting structures, often all we notice is the vascular discoloration or wilting.



Cankers and diebacks



Nectria canker



Citrus canker (leaves, stems, fruit)

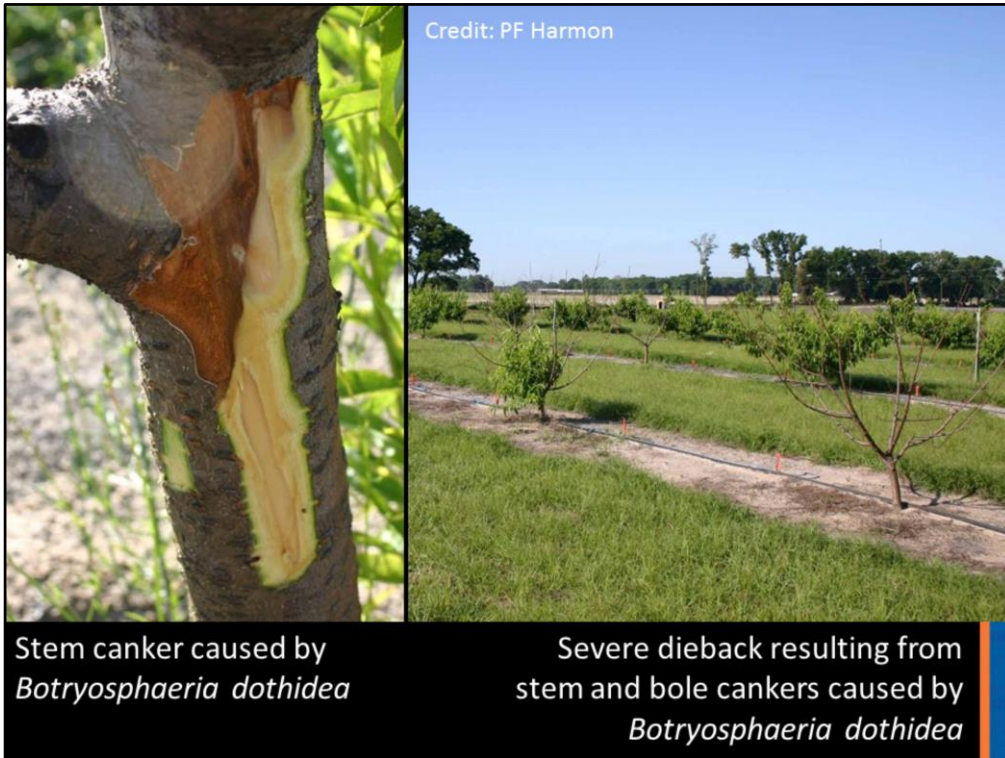
Cankers and dieback are related in that cankers can girdle stems, causing dieback. Some cankers may be superficial.



This is a dieback disease where you might see signs. If you noticed the shoot proliferation and swollen stem symptoms on the right, you might use a hand lens to look closer and find black pycnidia, like those in the image on the left.
Photo on left: The black bumps in the blighted area of this holly stem contain small black fruiting bodies of the pathogen, *Sphaeropsis tumefaciens*.



Sphaeropsis tumefaciens symptoms include galling and shoot proliferation on holly and Ixora (left and center) and cankers also on holly noticeable by cracked bark and discoloration of vasculature underneath.



Severe dieback resulting from stem and bole cankers caused by *Botryosphaeria dothidea*. There are no signs visible in these images. However, incubation of the discolored stem tissue may result in gray fluffy growth, mycelia of the pathogen.

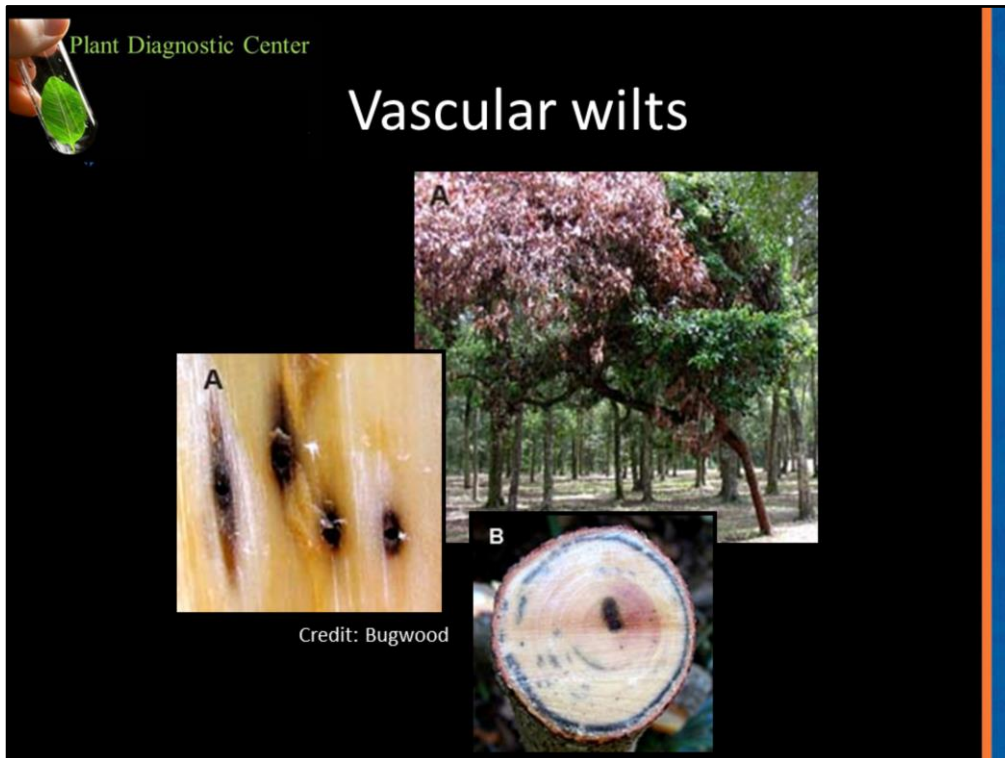


Vascular Wilts

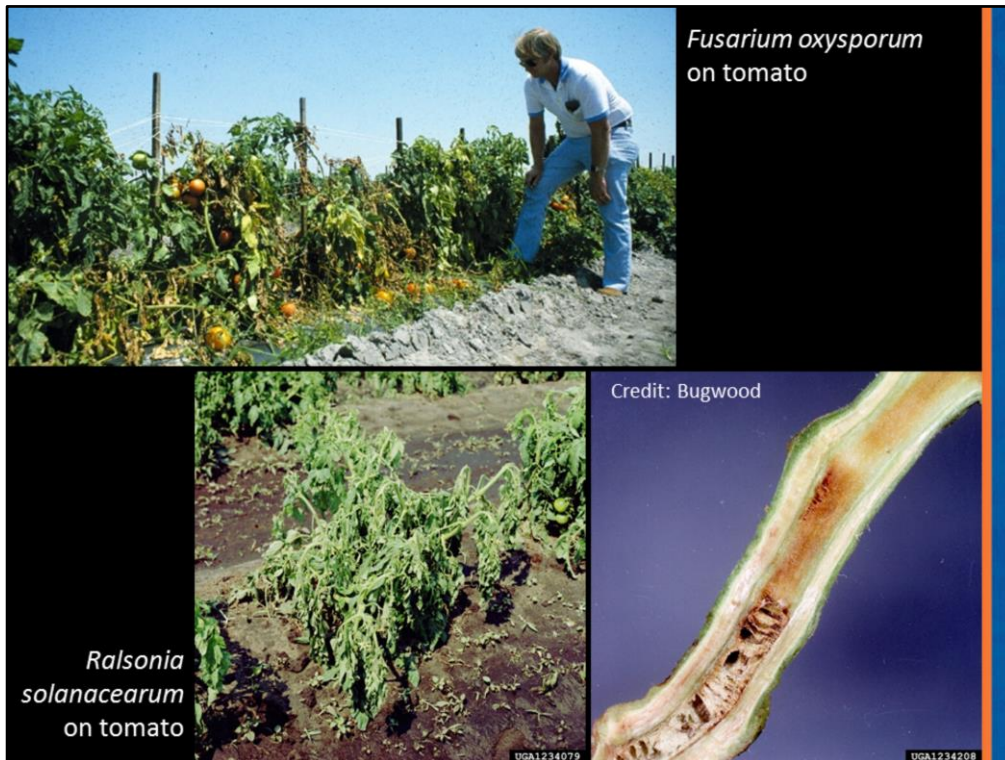
Symptoms: chlorosis, wilted foliage, vascular discoloration, premature death

Signs: ooze, gummosis

Symptoms include chlorosis, wilted foliage, vascular discoloration, premature death. Signs include ooze and gummosis. However these may not be signs of the pathogen, but may be symptoms caused by the plant.




Laurel wilt, caused by *Raffaelea lauricola*. Top right images we see brown leaves still attached to branches of a dead/dying tree, closeup A shows discoloration and rot around beetle wounds; closeup B shows a dark ring of vascular discoloration plus a dark rot in the heart wood.



Top image: *Fusarium oxysporum* on tomato (fusarium wilt)

Bottom images: *Ralsonia solanacearum* on tomato (southern wilt)

Wilt and vascular discoloration symptoms are the same, but only the southern wilt will have bacterial ooze (sign) from the stem. Only Fusarium wilt will produce (the sign) white mycelia from the discolored vasculature.



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Root Rots

Symptoms: brown mushy roots, stunting, wilting, yellowing

Signs: not many

Symptoms of root rots include brown mushy roots, stunting, wilting and yellowing. Hard to distinguish from several other disease types in the


field. Signs? Well, there probably won't be many unless you can get to the lab and culture something out.

Armillaria has mushrooms and mycelial mats

Phytophthora and other fungi will produce mycelial growth and spores from infected roots.

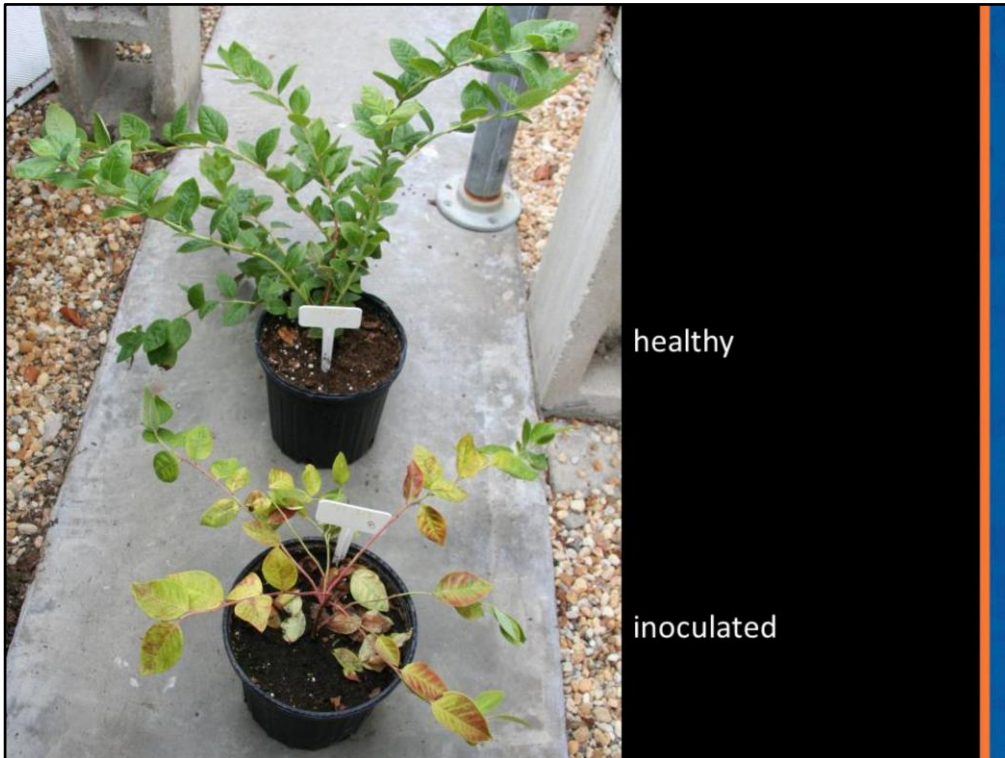
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Root rots

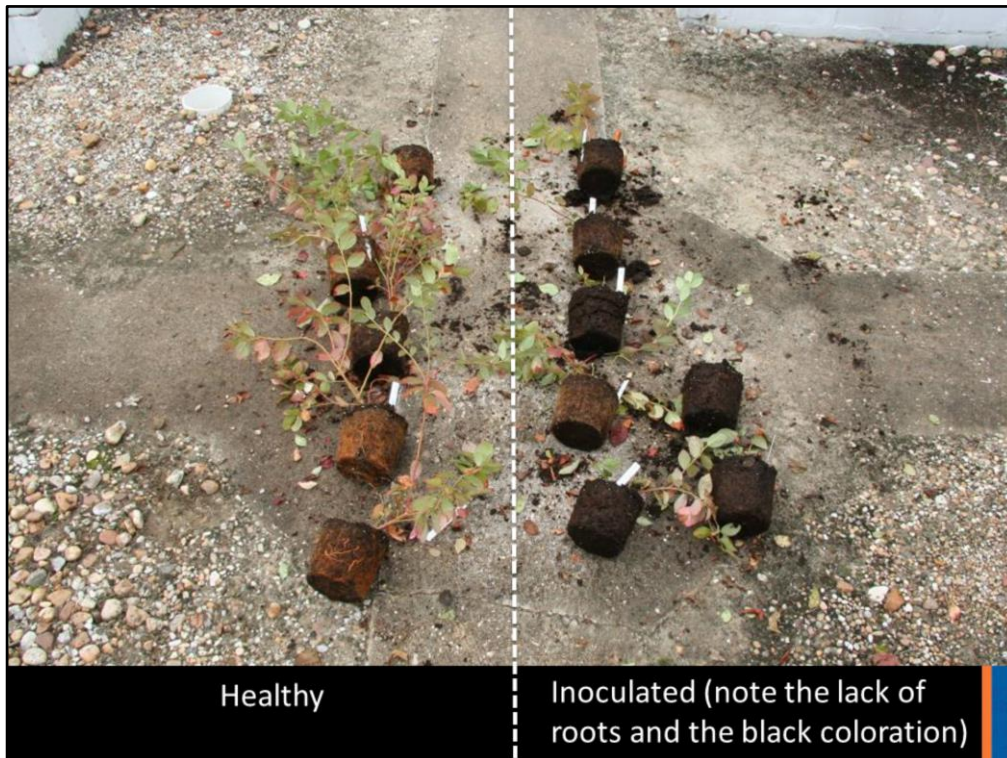


Soil borne organisms, usually fungi **cause** root rot.
Abiotic factors also cause root rot—water logged soil.

Soil borne organisms, usually fungi, cause root rot. Abiotic factors also cause root rot—water logged soil —although diseases are not caused by abiotic factors like environmental stress root rot is the symptom of disease, or can be a symptom of a disorder



The top plant is healthy and the bottom plant has been inoculated with a root rot pathogen. This shows us *Phytophthora* root rot symptoms of chlorotic and reddening leaves and poor growth.



This is a case where you really have to know what is normal to know what is not – the roots on the left are perfectly healthy. But they are brown! Blueberry roots are reddish-brown when healthy. Dark brown to black roots are a symptom of rotted roots, as you see on the right.





Viral Diseases

Symptoms: leaf mottling/mosaic, shortened internodes, stunting

Signs: scanning electron micrograph, inclusion bodies



Although the symptoms of viral disease can be striking, we rarely see signs of the pathogen, except with electron microscopy or inclusion body studies.



Viral diseases

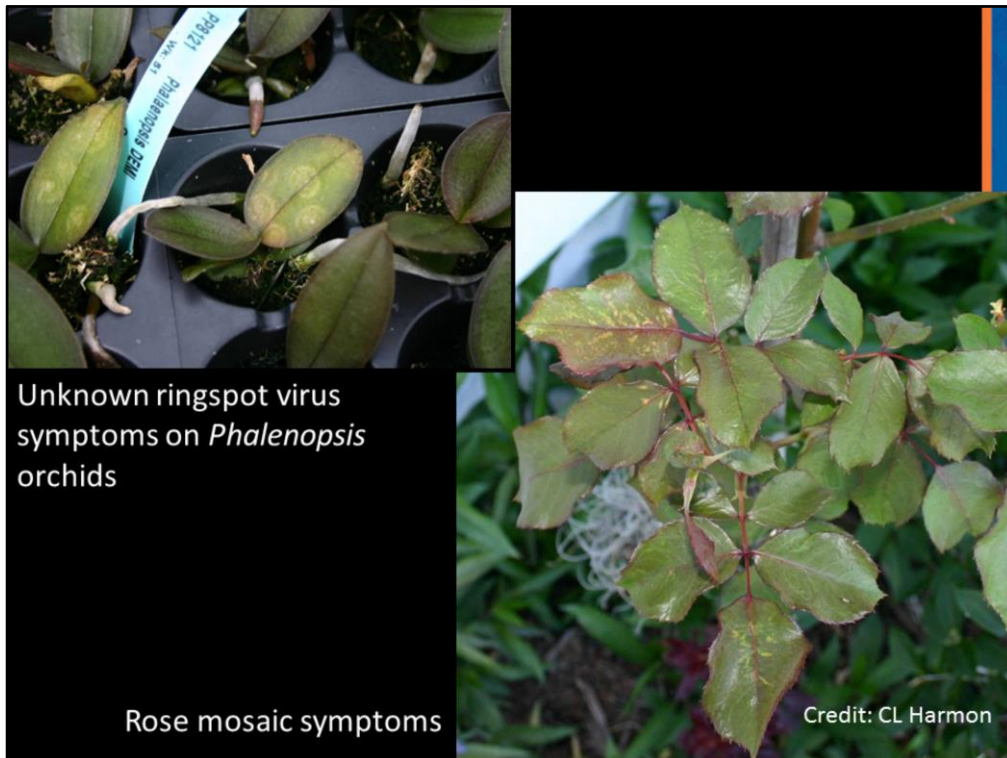


Photo by W. Witcher



Photo by R.O. Hampton


It seems like every kind of categorization we ever do has something called an “other” category. In this case, we’ll put our viral diseases here.



These images show ringspots and mosaic symptoms. No signs are going to be visible when just looking at the plant.

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Want more?



Read the short EDIS article:
Guidelines for Identification and Management of Plant Disease
Problems: Diagnosing Plant Diseases Caused by Fungi, Bacteria
and Viruses

That was a lot of information in a short time, so here is a quick review. Read the short EDIS article linked in the document icon. <http://edis.ifas.ufl.edu/mg442>




Sampling for disease management

Sampling for a disease problem

- Targeted to symptomatic plants
- Represent the problem
 - Symptoms
 - Plant parts
 - Get the site history, application history, cultivars, etc.

Survey samples, phytosanitary samples concentrate in trying to be confident in what is not there, or what may be very hard to find, such as with early detection of something new. Sampling for a disease problem is targeted to symptomatic plants. Confidence here is represented by collecting appropriate plant material to show the range of symptoms and the right plant parts to be able to detect the causal agent. Additionally, we need to get the site history, application history, cultivars, etc.



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Appropriate samples (your handout)

- 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.

Once you have identified a disease issue based on the symptom, you need to think about appropriate sampling. Dead plant material is almost never adequate.

Leaf spot/foliar blight diseases should be sampled by taking ~10 leaves showing a range of symptoms from light disease to very blighted. Stem tissue from the symptomatic area can be useful as well, focusing on areas that have some healthy and some symptomatic tissue. With wilt diseases, the whole plant is best, or plenty of fresh symptomatic but not dead tissue from the roots, stems, and leaves.


Turf diseases are a special case. You want to cut a patch of the turf out, including roots, from an area that has some healthy and some affected turf.

With potential virus diseases, new, symptomatic tissue is usually best. Include symptomatic flowers, fruits, and a whole plant if possible since virus particles accumulate in different tissues depending on the virus. Be sure to note insects (potential vectors) if present, since they may not survive the shipment well.



Disease diagnosis is a process

- Do you know the normal growth for a plant and what conditions are optimal for growth?
- What conditions has the plant has been exposed to (irrigation, sun/shade, fertility, when was it planted, etc.)?
- Put all the clues together to figure out the main cause of the plant problem.
- THEN we can manage the problem!



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Summary

- Symptoms are plant indications of disease
- Signs are evidence of pathogens
- Symptoms can include wilting, spots, diebacks, cankers, and more
- Signs can include spores, mushrooms, ooze, and more
- Diagnosis is an investigative process, requiring representative samples, good site information, appropriate tests, and knowledge and experience to put it all together
- Google: UF PDC

Symptoms are plant indications of disease

Signs are evidence of pathogens

Symptoms can include wilting, spots, diebacks, cankers, and more

Signs can include spores, mushrooms, ooze, and more

Sampling for survey and disease management purposes require different kinds of samples

Diagnosis is an investigative process, requiring representative samples, good site information, appropriate tests, and knowledge and experience to put it all together

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PEOPLE ACADEMICS EXTENSION RESOURCES

The UF/IFAS Plant Diagnostic Center

The UF/IFAS Plant Diagnostic Center in Gainesville (PDC-GNV) is the resource plant diagnostic laboratory for the citizens of Florida, the Florida Plant Diagnostic Network, and is the location of the Rapid Turfgrass Diagnostic Service. We are available Monday-Friday 8:00 am - 5:00 pm (except state and UF holidays) and can be reached at (352) 392-1750 or pd@ifas.ufl.edu. The PDC-GNV is also the hub lab for the Southern Plant Diagnostic Network and a major participant in the National Plant Diagnostic Network. Our lab is accredited through the NPDNS ISO17025-based STAN-Q program.

The PDC-GNV serves the state and region through diagnosis of commercial, homeowner, and extension plant disease samples submitted to the laboratory for turf, ornamentals, fruits and vegetables, and other plants. Specific areas of diagnostic expertise include: Turf, palm, and blueberry diseases, Asian soybean rust, citrus greening, Fusarium and phytoplasma wilts of palm, bacterial leaf scorch and red ringpod virus of blueberry, phytoplasma, and sudden oak death/banana sigatoka. The FEEDC can now accept and diagnose samples from outside the US. Please contact us at (352) 392-1750 for forms, permits, and more information on our international service.

FEEDC-Gainesville personnel support the educational and outreach activities of the Department of Plant Pathology by providing assistantships and internships for Doctor of Plant Medicine and other graduate students, through participation in departmental courses, and by providing Extension Agent and Master Gardener training.

Want to know what's going on in the lab this week? Visit us on Facebook and follow us on Twitter (@UFLPLANTDR). Or visit us in person. Find us on the map.

Last modified: Thu, 08 Oct 2015 14:15:08 EDT

Sample Collection and Submission Instructions (pdf)

General Diagnostic Sample Submission Form (pdf)

Turfgrass Sample Submission Form (pdf)

Pricing

Hours of Operation

Clinic Information

Clinic Personnel

YouTube

- What is the PDC?
- What happens to my sample in the PDC?

Do you know what happens to a sample in a diagnostic lab? Watch a short video.





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We're here to make YOU
look good!



Basics of plant disease



Questions to ask the client

Thank you!
Carrie Lapaire Harmon, UF-IFAS