

Introduction to Diagnosing Plant Health Issues

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**COLORADO STATE UNIVERSITY
EXTENSION**



Plant Diagnostic Process

- Process used for the identification of plant health problems
- **Tools:** Plant sciences (plant pathology and entomology) and detective skills (research)



Marssonina Leaf Spot



End-Blossom Rot



Early Blight



Fireblight

Iron
Chlorosis



Sunscald



Plant Pathology is the study of diseases and disorders of plants

- **Disease** is a harmful deviation from normal growth caused by an infectious (living) agent...**BIOTIC FACTORS!!**
- **Disorder** is a harmful deviation caused by a non-infectious (non-living) agent...**ABIOTIC FACTORS!!!**

Entomology is the scientific study of insects and arthropods



Cucumber Beetles



Spider Mites

Insect Damage on Plants is caused by

- Chewing plant parts
- Sucking plant juices
- Boring within the roots, stems or leaves
- Transmission of plant diseases



Emerald Ash Borer



Aphids



Hard and Soft Scale Insects



Toolkit for Sample Collection: Field Diagnosis

List of handy items in your tool box:

- Hand lens/magnifying glass
- Binoculars
- Pocket knife
- Soil probe
- Shovel
- Notebook and pencil
- Plastic bags
- Insect collection jars
- Hand pruners

Why is it important to accurately
diagnose plant problems?

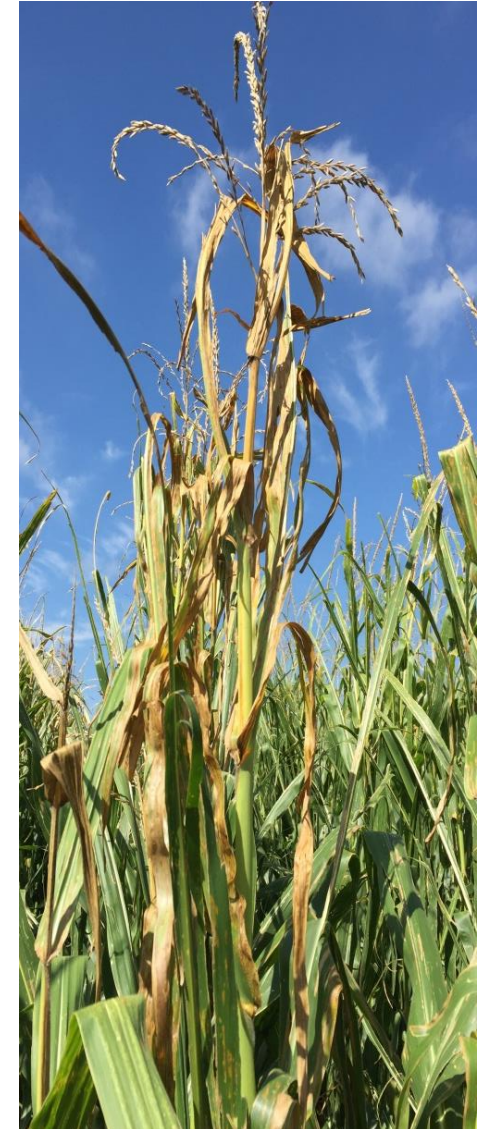
Are these symptoms representing the same disease?



Gray Leaf Spot
Cercospora zeae-maydis

Bacterial Leaf Streak
Xanthomonas vasicola pv. *vasculorum*

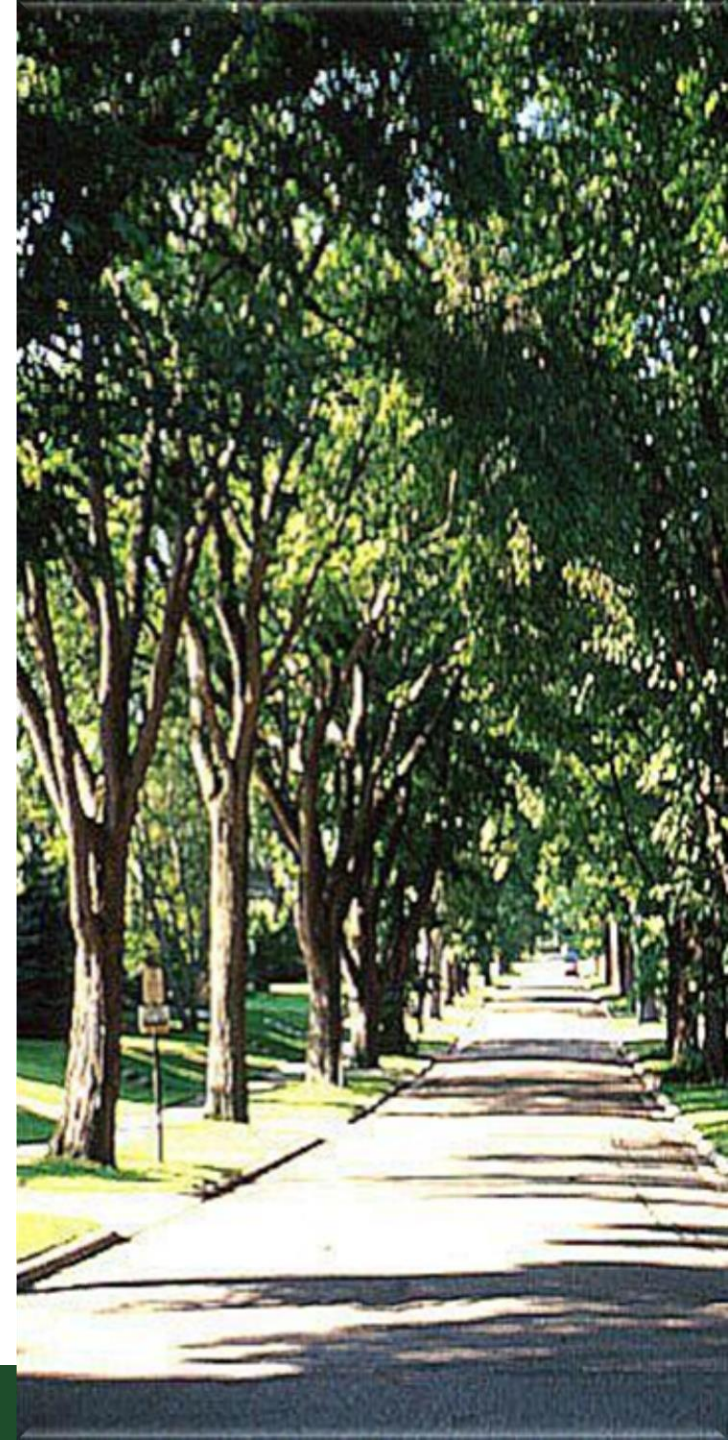
- If we know the identity of the causal agent we can better understand its biology and offer effective management strategies



Early detection of exotic and/or devastating pests and pathogens



- We do not know the risk that a new pathogen/pest poses in a new area
- Quick actions to prevent further spread can save many plant species
- Often no genetic resistance in native population or natural predators to exotic pathogen/pests.
- Dutch elm disease has killed millions of American elms in the urban landscape in the last 50 years



Plant Diagnostic Process



1. Identify the plant



2. Identify what a healthy plant looks like and what is normal vs abnormal



3. Identify the problem



4. Identify the pattern of damage



5. Review cultural practices



6. Research possible causes (options) sources (site: edu, site: colostate.edu (specific to Colorado))



7. Evaluate effective management strategies

Biotic vs Abiotic problems

- **Biotic (living) agents:**

- Pathogens - parasitic microorganisms that cause disease
- Virus, bacteria, nematodes, fungi, oomycetes (fungal-like), phytoplasmas
- Pests – insects, other arthropods, or mammals feeding on or damaging the plants



- **Abiotic (non-living) agents:**

- Chemical damage
- Physical damage (mechanical or weather)
- Nutritional problems



Symptoms

- Symptoms are changes in the plant's growth or appearance in response to causal factors
- Localized symptoms: Restricted to a part of the plant (leaf spot)
- Systemic symptoms: Affecting entire plant (wilt, mosaic patterns)
- Symptoms are the primary method of field diagnosis (**VERY IMPORTANT!!!**)
- Different pathogens, abiotic stresses may cause the same symptoms



Examples of Symptoms



Canker

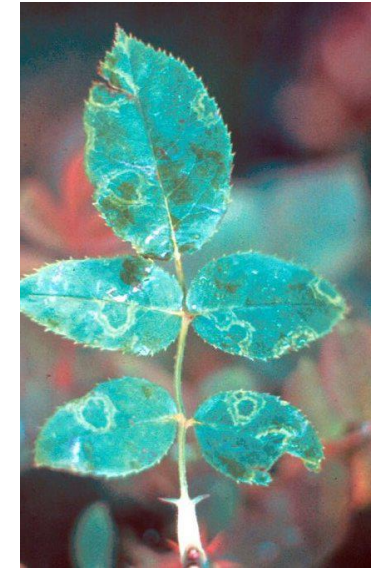


Galls

Yellowing (Chlorosis)



Blights



Mosaic Pattern

Leaf Spot



Symptoms

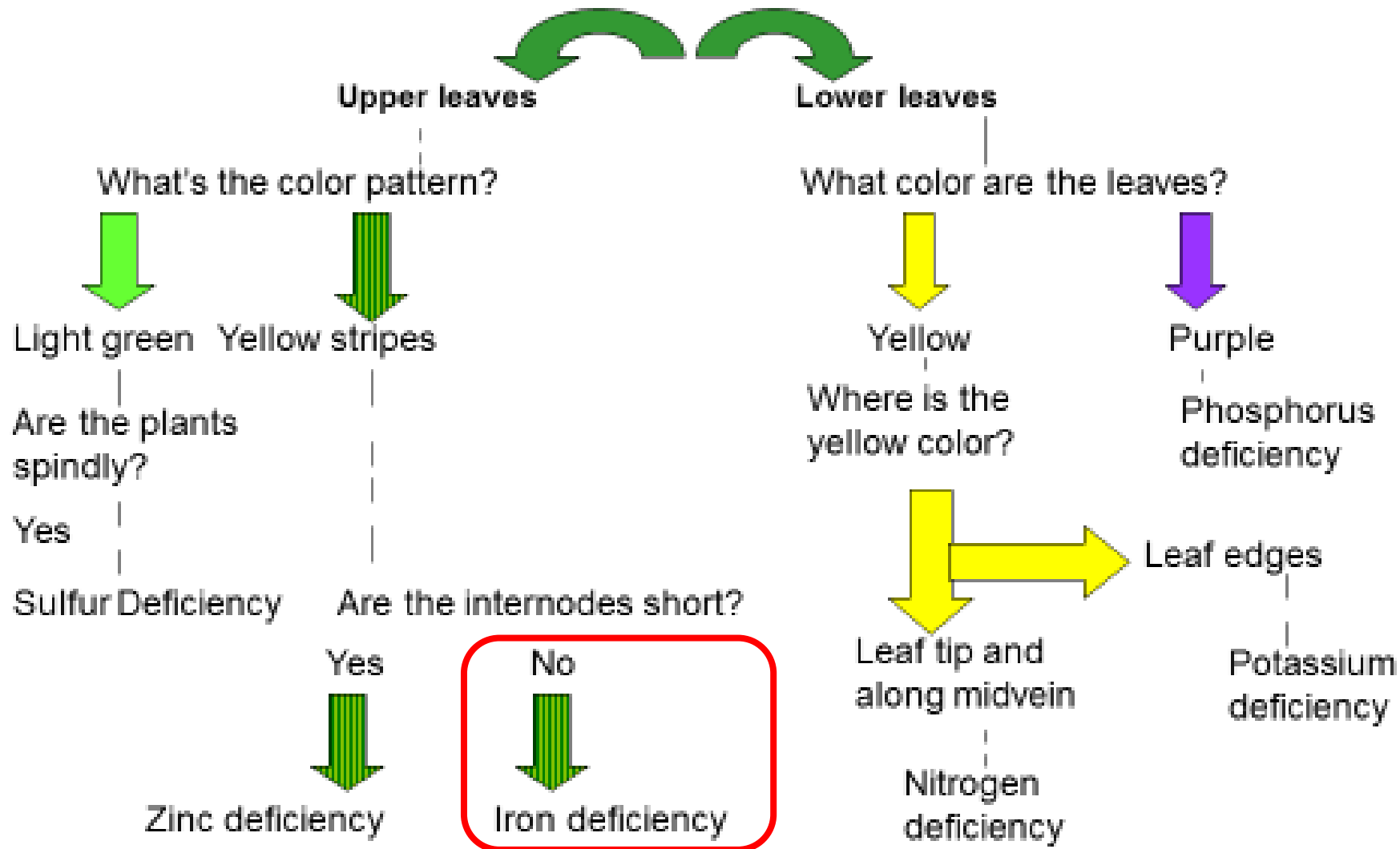
- Be aware of symptom variability and progression
- Environmental conditions, host genetics, and physiology can affect appearance of symptoms
- Plants may have more than one problem
- Primary vs secondary symptoms

Sudden Needle Drop of Spruce



Nutrient Deficiency Symptoms

Are the symptoms on the lower leaves or the upper leaves?



Iron Deficiency on Corn



Signs

- A sign is a macroscopic or microscopic structure/product of the pathogen/pest
- “Fingerprints” (evidence of pathogen)
- Signs are much better diagnostic features than symptoms!
- **Only biotic agents have signs!**



Mycelia



Bacterial Ooze



Spores (Conidia)



Fruiting Bodies



Nematode



Spores



Identify the pattern of damage

- How do symptoms progress?
- Evaluate other parts of the plant (stems, roots, fruit, flowers, leaves)
- **Biotic problems:**
 - Symptoms are progressive and overtime become worse affecting nearby plants
 - Symptoms are scattered (random) and localized
- **Abiotic problems:**
 - Large area or all plants generally affected
 - Generally lack symptom progression (overnight symptoms)
 - Exception: Nutritional symptoms progress slowly
 - Do not discriminate between plants



Ask questions!

- How many plants are affected?
- When was the problem first noticed?
- Was the damage sudden or gradual?
- How old are the affected plants?



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4. Identify the pattern of damage



5. Review cultural practices



6. Research possible causes (options)



7. Evaluate effective management strategies



Additional Resources: Soil and Plant Diagnostic Clinic

CSU Main Campus: plantclinic.agsci.colostate.edu

Jefferson County: jeffco.extension.colostate.edu/horticulture/clinic/