Distinguishing Disease and Insect Problems from Environmental Stresses

Biotic versus Abiotic

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Integrated Pest Management Update 2011

Photos: H. Glenn, UF/IFAS (unless otherwise noted)
Plant Problems

**Abiotic**
- Non-living (environmental stresses, physiological and other nonbiological factors)

**Biotic**
- Living organisms (Insects, pathogens, weeds, nematodes, parasitic plants, viruses)

Whatever the cause of the problem or damage, accurate diagnosis is necessary to solve the problem.
Diagnosing Problems in the Landscape

• Many abiotic and biotic agents can cause injury
  – Become familiar with common causes of damage

• Landscapes exhibit tremendous variability
  – Diversity in plants, soils, environmental conditions
  – Diversity over time
  – Landscapes are dynamic
Diagnosing Problems in the Landscape

• A problem can have multiple or interacting factors
  – Individual factors may cause injury alone or in conjunction with other factors

• Chronic problems may express subtle symptoms
  – Symptoms may not be obvious (i.e. slow growth)
Abiotic Disorders

- Water issues
- Aeration
- Nutrient deficiencies
- Salinity
- pH
- Temperature
- Sunburn
- Light

- Wind
- Pollution
- Lightening
- Root girdling
- Mechanical injury
- Pesticide phytotoxicity
Similarities in Abiotic and Biotic Plant Problems

• Your plant is chlorotic and dropping leaves
• Could it be caused by:
  - Excess Fertilizer
  - Insect
  - Temperature Extreme
  - Lack of Water
  - Disease
• Any of these as well as others could be the problem
Biotic Injury
- Other evidence (i.e. presence of an insect, cast skins, frass, fungal spores, etc.)
- Biotic injury may spread progressively in a plant or to other plants
- Some biotic problems are specific

Abiotic Injury
- Physical evidence not usually on the plant (i.e. wind damage, herbicide damage, etc)
- Does not usually spread
- May affect numerous plant species
Diagnosing the Problem

• Plant identification
• Identify the symptoms
• Inspect the entire plant
• Inspect the site
• Look for patterns
• Management history
• Test likely causes
Wilting - Browning

- Lack of water or inability to take up water
- Low temperatures
- Biotic agents (microorganisms, nematodes, insects)

Cold damage to banana
Wilting - Browning

- Plant type - Avocado
- Small holes in trunk
- Dark “bluish” streaking

Laurel Wilt Disease
Necrosis (death) • Water deficit
• Salt toxicity
• Nutrient deficiency
• Pollution
• Temperature extremes
• Pesticide toxicities
• Biotic agents (i.e. microorganisms, nematodes, insects, mites)

Phytotoxicity from a Fungicide (Daconil)
Chlorosis (Yellowing)

- Mottling or irregular patterns; stippling; bleaching
- Biotic agents (i.e. microorganisms, viruses, insects, mites); nutrient deficiencies
Chlorosis (Yellowing)

- Palms - good example of specific yellowing patterns due to nutrient deficiencies

- Magnesium deficiency in *Phoenix canariensis* showing broad yellow bands along the margins of the oldest leaves. (Photo: T. Broschat, UF/IFAS)
Necrosis - Yellowing

• Pay attention to patterns within and among plants
  – Marginal (leaf edges)
  – Size and appearance (blotches, spots)
  – Inteveinal (tissue between veins affected)
  – Speed of appearance or spread
Water Soaking - Lesions - Edema

- Changes in moisture and or temperature
- Biotic agents (i.e. microorganisms, viruses, insects)
Distortion

• Other symptoms often accompany distortion (chlorosis, necrosis, etc)
• Herbicide damage
• Other pesticide toxicity
• Low temperatures
• Insects and mites
Distortion
Defoliation

- Host plant
- Low temperatures
- Herbicide damage
- Deficiency in water, aeration
- Pollution
- Insect, diseases
- Timing and speed of defoliation

Ficus whitefly
Bleeding and Gumming (the flow of sap)

- Water deficit
- Mechanical injury
- Diseases (canker, fungi, bacteria) insects
Plant Galls

• Extremely variable in location, size and shape
• May or may not be damaging to the plant
• Abiotic origins
• Biotic causes include disease organisms, nematodes, insects and mites
Other Types of Damage

Weed eater or lawn mower damage

Damage from power lines
Other Types of Damage

- Rat damage
- Plant Structure
- Red Palm Mite
Other Types of Damage

Cannonball fungi

Webbing from psocids
Other Types of Damage

Ascheroni sp. (entomopathogenic fungi)

Lightening damage
Secondary Pests

Abiotic factors often weaken plants making them more susceptible to biotic factors

– For example overwatering can lead to root disease
– Wood boring insects common secondary pests
Expect Additional Problems when Plants Have Been Severely Stressed
Diagnosing Plant Problems

• Detective work
• Familiarity with common problems
• Step by step rule out known causes
• May need tests conducted by professionals
  – Bioassays for diseases, nematodes
  – Soil and water
  – Insect Id
• Use your resources
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