

Abiotic Disorders of Native Plants



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Causes of Plant Disease

Biotic/Living agents:

Living organisms – often referred to as “Plant Pathogens”

- Fungi-> 85, 000 diseases
- Bacteria- > 250 diseases
- Nematodes - > 1000 diseases
- Plant Viruses- > 500 diseases
- Parasitic plants - > 2500 plants
- Insects-

Abiotic/Non living agents:

- A non-living cause of plant disease. Sometimes also termed “physiological disorders”.

Identification/Disease diagnosis:

- Management options differ depending on the cause of the disease

Non Living Disorders

- Abiotic disorders may be caused by a single extreme environmental event such as one night of severe cold following a warm spell or by a complex of interrelated factors or events.
- They can also be caused by chronic conditions such as a prolonged drought or plant selection inappropriate for the existing site conditions (e.g., planting an acid-loving species in an alkaline soil).
- The impact of these disorders on plant health is influenced by many factors including the type, severity and duration of the stress, species susceptibility to the specific disorder.
- Stress created by abiotic pathogens frequently predisposes landscape plants to secondary biotic pests such as borers, bark beetles, canker and root disease fungi that contributes to further decline and death.

Abiotic / Non Living/ Non Pathological disorders

- “Abiotic” to indicate that the symptom is not caused by any biological agent such as an insect, mite or plant pathogens.
- Non-living/ non pathological causal factors:
 - ☐ Weather, soils, chemicals,
 - ☐ mechanical injuries, cultural practices
 - ☐ In some cases, a genetic predisposition [mutations, chimeras] within the host plant.

Diagnosing abiotic disorders

Know the characteristics of the plant when healthy to identify symptoms of distress

- Identify where symptoms are appearing (new leaves, old leaves, edge of leaf etc.)
- Identify field pattern of symptoms [Field margins, Center]
- Follow directions on label of product for applying any chemicals, fertilizers etc.



Diagnosis Steps

- Identify the host plant
- Familiarize with healthy plants and unique host characters
- Note pattern of damage on individual plants
- Examine pattern of disease/disorder occurrence in the field
- LOOK – Define the problem [signs and symptoms]
- REFER – Reference materials describing similar disorders
- COMPARE – Determine probable cause(s) through comparison and elimination



Cleome Spp, Chimera?

Abiotic Agents: Plant Nutrition

Macro nutrients:

- Required in relatively large amounts: nitrogen, potassium, sulfur, calcium, magnesium and phosphorus.

Micro nutrients:

- Required in small amounts (sometimes trace amounts), like iron, boron, manganese, zinc, copper, chlorine and molybdenum.

Both macro- and micronutrients are naturally obtained by the roots from the soil under optimal growing conditions.

Deficiency Symptoms



Iron deficiency This can sometimes occur in limestone or chalky soils. A distinct yellowing of the leaves (chlorosis) is obvious. The remedy is to apply expensive foliar feeds known as chelates or sequestrates. Some rose varieties appear to thrive better than others in such conditions, particularly common reds and hard pinks.



Nitrogen deficiency A condition most commonly associated with poor feeding. The plant looks stunted and red spots sometimes appear on young leaves. Apply plenty of organic manure to improve the plant's appearance.



Manganese deficiency Yellow bands between the veins of leaves are a sign of this condition. Treat the plants as you would in the case of iron deficiency (see left), but note that manganese deficiency is a warning that the garden is badly drained. Bad drainage can be alleviated by deep digging and adding coarse grit or sand to the soil.



Phosphate deficiency The leaves will look very pretty with blue-green and purple tints and an early leaf fall. A comprehensive fertiliser which includes trace elements is the quickest remedy.

Deficiency Symptoms

Nitrogen Deficiency



Symptoms include pale green foliage, yellowing of older leaves & twig dieback. [Photo: R G Weir & G C Cresswell 1993]

Manganese Deficiency



Yellowing towards apex of leaves with a triangular area remaining green at base in older leaves Photo: R G Weir & G C Cresswell 1993

Deficiency Symptoms

Phosphate deficiency



Yellowing and brown necrosis spreading from margins between veins of older leaves

Deficiency Symptoms

Zinc Deficiency



Leaves generally small & narrow, creamy white to yellow blotches on young leaves

Iron Deficiency



Young leaves chlorotic, stunted abnormal growth, margins/veins stay green longest.

Over fertilization

Over fertilization - Over fertilization also causes marginal leaf burn. In young plants, too much fertilizer can lead to death



Blue berries

Potassium Deficiency - K deficiency results in marginal leaf burn

(Photo: Cornell Univ).

Temperature Extremes

HIGH TEMPERATURE DISEASE:

Heat Defoliation and Leaf Scorch

- High temperature and drying winds:
- Leaf margins turning yellow or brown and premature defoliation.
- Select locations protected from prolonged exposure to sun and wind



LOW TEMPERATURE DISEASE: Frost Injury

- An early fall or late spring frost when plants are actively growing can injure or kill succulent stem tissue, leaves, and buds.
- Plant tree species adapted to local conditions.
- Avoid planting in low lying areas subject to frost.



MOISTURE EXTREMES

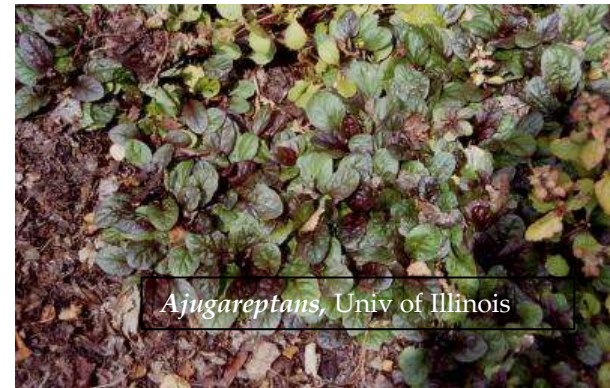
Drought

- Symptoms include wilting, off-color foliage, twig and branch, dieback in the crown.



Excess Moisture or Flooding:

- Reduced growth, small leaves and thin crowns, twig and branch dieback.



INJURIES BY CHEMICALS SUBSTANCES

HOW PLANTS ARE EXPOSED TO HERBICIDES:

1. Drift or Volatilization
2. Leaching or Run-off
3. Misapplication
4. Contaminated Soil Amendments

Herbicide Injury:

Salt Injury

Air Pollution

Glyphosate herbicide drift damage

[Image: Univ. of Illinois]



Examples of plant growth distortions likely associated with disease-induced hormone perturbations.

Examples of plant growth distortions likely associated with disease-induced hormone perturbations.

(A) Rust (*Atelocaula digitata*) on Acacia koa leaf, Hawaii.

(B) Wheat infected with leaf rust (*Puccinia striiformis*) showing “green islands” in some interactions.

(C) Wool sower gall maker (*Callirhytis seminator*) on oak.

(D) Crown gall caused by *Agrobacterium tumefaciens*.

(E) Witches broom in silver birch caused by *Taphrina* sp.

(F) *Gymnosporangium cornutum* rust on European mountain-ash.

[M R Grant and J D G Jones, Science 2009;324:750-752]



Biological/Botanical disorders

Abiotic abnormalities [biological/botanical in Origin].

The genetic makeup of a species is expressed through its physiological and morphological characteristics.

- Genetic mutations and reversions
- Chimeras:
- Leaf abscission and retention
- Galls and burls
- Branch architecture



Ficus benjamina



Cleome Spp, [R. Sampangi]



Spirea with various chimeric patterns. [Photo: U of MN]

Nutrient deficiencies

- Growth can be affected by shortages of necessary nutrients, or because the nutrients are present but not available to the plant.
- The latter can be caused by incorrect [pH](#), shortages of water or an excess of another nutrient.
- Generally, the key to avoiding nutrient deficiencies is to ensure that the soil is healthy and contains plenty of organic matter.

Nutrient (or mineral) deficiencies include:

[Boron deficiency](#)

[Calcium deficiency](#)

[Iron deficiency](#)

[Magnesium deficiency](#)

[Manganese deficiency](#)

[Nitrogen deficiency](#)

[Phosphorus deficiency](#)

[Potassium deficiency](#)

Shortage of [trace elements](#) such as [molybdenum](#) can also cause disorders

Soil Disorders

- Insufficient Soil Volume
- Adverse pH
- Low Organic Matter
- Nutrient Deficiencies
- Contaminants
- Compaction
- Drainage

Summary

- **Plant selection:** Match species to site environmental conditions.
- **Soil conditions:** Know your soils and keep records of soil nutrient and pH levels.
- **Water quality:** Water quality can dramatically affect crops [alkalinity, soluble salts and PH]
- **Irrigation management:** Over-irrigating and under irrigating can cause plant problems.
- **Nutrition management:** Poor nutrition can reduce plant health and vigor.
- **Employ best management practices:** planting and managing the native plants

References

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Questions?



Thank you!

