47. Yellows, or Chlorosis

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Hosts

All green plants are susceptible to foliage yellowing, or chlorosis.

Distribution

The disease occurs throughout the temperate regions of the world.

Damage

The amount of growth reduction or mortality of seedlings depends upon the cause of the problem, the length of time the plants are chlorotic, and the degree of chlorophyll deficiency. Chlorosis is sometimes associated with rapid mortality of the root system and plant. At other times, severe symptoms for a brief period may cause only slight growth reductions. If it persists for several months, however, severe yellowing is likely to cause high mortality.

In general, chlorotic seedlings are unusually sensitive to high or low temperatures, nematodes, fungi, bacteria, pesticides, and other factors.

Diagnosis

Chlorosis of seedlings may be caused by any of several factors, so the usual diagnostic procedure involves a process of elimination, with obvious and easily determined causes checked first. Look for excess soil water, insects, heat or cold injury, and fungal disease symptoms. Foliar and soil analysis will pinpoint any major nutritional deficiencies.

Biology

The terms "yellows" and "chlorosis" are used to describe any physiological disturbance or disease of plants resulting in the yellowing or blanching of foliage (fig. 47-1). The destruction or reduced synthesis of chlorophyll may be caused by any number of biotic or abiotic factors, and two or more factors often combine to cause chlorosis of forest tree seedlings. The more common factors follow:

1. Deficiencies or excesses of mineral elements essential to plants such as iron, nitrogen, phosphorus, potassium, and calcium, along with minor elements such as magnesium, manganese, zinc, boron, copper, molybdenum, and sulfur.

2. Toxic concentrations of chemical compounds such as herbicides, fungicides, nematicides, insecticides, and other compounds used in nurseries.

3. Feeding by insects and mites, such as red spider mites on coniferous seedlings. Feeding is more commonly associated with chlorosis than is oviposition, stinging, or other insect activities.

4. Parasitic fungi, bacteria, and nematodes that cause root, stem, or foliage disease. These pathogens are commonly associated with chlorotic seedlings (fig. 47-2).

5. Certain viruses and mycoplasmas that primarily affect hardwood tree species.

6. Genetic abnormalities, which result in the loss of ability to synthesize chlorophyll. This loss may be caused by mutation or may be simply inherited. Albinism is the most common genetic abnormality associated with chlorotic forest tree seedlings.

7. Excess soil water and high or low soil and air temperatures. These factors may cause environmental stresses on the plant. Cold temperatures, for example, are often associated with the synthesis of pigments other than chlorophyll,

Figure 47-1—Chlorosis of pine seedlings associated with iron deficiency.

Figure 47-2—Chlorosis of pine seedlings associated with root disease.

leading to red, purple, yellow, or other pigmentation. Excess water or heat may be short-term conditions and disappear when the weather changes.

8. Practices such as excessive and repeated use of soil fumigants and fungicides that may temporarily reduce the number of mycorrhizal feeder roots.

9. Parasitic seed plants, such as dodder or seymeria, which may have adverse effects on tree seedlings.

10. Soils that are alkaline (high pH) or saline (high in soluble salts). Symptoms are illustrated in chapter 55 on salinity damage.

Control

Biological—Mycorrhizal feeder roots will usually be replenished when the natural fungus inoculum source is adequate. However, artificial inoculations with selected ectomycorrhizal fungi may be required in some cases.

Cultural—The removal of excess fertilizer or toxic chemicals from soil is often difficult and may require fallowing the contaminated area until the material has deteriorated or has been leached below the plant root zone. The mechanical removal of chemically contaminated soil from some seedbeds may be required. Control viral, mycoplasmic, and certain bacterial diseases by removing infected seedlings from the nursery. Reduce air and soil temperatures by mulching, shading, and irrigating seedbeds. Ensure that soil drains properly to eliminate excess soil water. Correct nutrient deficiencies by applying the requisite mineral element(s) to the foliage or soil.

Chemical—Root diseases can be controlled by fumigating the soil with methyl bromide or other fumigants before sowing seeds. Foliage and stem pathogens can be controlled with fungicidal foliar sprays. Insects and mites can be controlled with insecticides.

Selected References

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