

## The Process of Plant Disease Diagnosis

### Randolph Keim

Keim's Plant Disease Clinic, 136 W. Ramona, San Clemente, California 92672

### ABIOTIC VERSUS BIOTIC DISEASES

Illnesses of plants are caused by factors that are either living or nonliving and that may predispose to each other. For example, overly wet roots may be weakened and more susceptible to biotic root rot, and biotically infected roots may reduce water uptake and cause normally watered plants to suffer from lack of oxygen.

### BIOTIC FACTORS.

- 1) Insects—small ones, such as psyllids, thrips, borers, webworms, midges, mites (arachnids), or larger types—may distort and discolor tissues in many ways resembling diseases.
- 2) Nematodes may cause general plant growth suppression by damaging roots with galls and distortion.
- 3) Vertebrates, such as, gophers, mice, rats, deer, or coyotes may feed on plant parts.
- 4) Diseases by fungi, bacteria, or viruses.

**Abiotic Factors.** Abiotic factors include, but are not limited to, wind, frost, water excess, water stress, heat excess, sunburn, salt, chemical toxicity, smog, or herbicides. In viewing a plant or plants in distress, these abiotic factors must be identified as potential causes before moving on.

### CROP

Crop refers to plants in commercial production or monocultural landscapes.

- Random occurrence of a disease syndrome is indicative of a biotic cause (as in flu infections in a human population.)
- Uniform occurrence of an abnormality suggests an environmental (abiotic) cause.

### INDIVIDUAL PLANTS

**Overall Symptoms.** If the entire above-ground portion of the plant shows abnormal symptoms, an infection is likely in the collar area (region immediately above and below the soil surface), on the roots, or by a virus.

**Above-Ground Symptoms.** Localized above ground symptoms include burnt leaf margins, leaf spots, leaf blotches, blossom blight, shoot tip blight, dieback, stem blight, cankers, or leaf specks.

**Partly Overall Symptoms.** Partly overall symptoms are often caused by vascular diseases.

## MANAGING CAUSES OF BIOTIC DISEASES

**Root Problems.** Roots, stolons, or rhizomes are more often diseased in containers than in the landscape except for turf. In the landscape, biotic root diseases more commonly occur with annuals or shrubs than with trees.

- Root rot may be caused by many different fungi, but in southern California, they are mainly *Pythium*, *Fusarium*, *Rhizoctonia*, *Phytophthora*, or *Thielaviopsis*.
- Identification of possible pathogens may be done by a commercial lab.
- With the pathogen identified, selecting materials for drenching or spraying on the foliage is greatly simplified.
- With big landscape trees, bleeding, decline, or death are more often than not water related.

**Collar Problems.** Infections at the collar are often terminal because the plant may be girdled. These are common in the landscape. The most common pathogen causing collar rot is the fungus, *Phytophthora*.

- Predisposition to infection may occur from excessive moisture at the collar. Reduction of predisposition may be achieved by careful water management.
- In a multiple planting, diseased specimens should be rogued.
- Those not entirely girdled may be surgically helped.
- Fungicides specific for *Phytophthora* control are available.

**Crown Disorders.** Diseases of the blossoms, shoot tips, leaves, or stems must be diagnosed for cause by either referenced findings or laboratory culturing.

- They may be caused primarily by fungi or bacteria on a local basis. Nematodes also may cause foliar necrosis, while viral symptoms represent systemic infections.
- Environmental conditions are extremely important in the management of crown disorders. "Cool and moist" are the standard favorable conditions described in the literature.
- There are contact and systemic fungicides, but primarily contact bactericides. The latter must be timed to protect the susceptible tissues when conditions are favorable.
- Reduction of favorable foliar moisture conditions may help.

**Vascular Diseases.** The name is derived from infections of roots by soil-borne fungi that migrate upward in the conductive tissues.

- They may be identified by an unbalanced decline of the crown.
- Darkened vascular tissue may be cultured by a commercial lab.
- Pathogens of vascular diseases are difficult to control.

**Virus Diseases.** They are systemically spread throughout the entire plant except meristem tissues.

- Symptoms include weakened plants, chlorotic patterns, shothole of leaves, color breaks of blooms, and more.
- Since the virus particles are in most tissues, propagation must be restricted to virus-free stock.