# INTRODUCTION TO PLANT DISEASES FOR THE GREENHOUSE SCOUT

PLANT PATHOLOGY is the science of plant diseases.

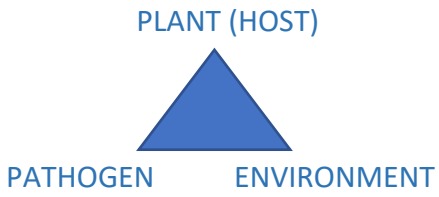
Plant diseases may have one of two kinds of causes: ABIOTIC (non-living) and BIOTIC (living).

Abiotic diseases are caused by all manner of environmental stresses—things like too much or too little water, too much or too little light, too much or too little fertilizer, the wrong pH or air pollution. These diseases do not spread and they exist only in the vicinity of the source of the stress. Typically all the plants in an area will show abiotic symptoms somewhat uniformly (cultural problems often affect all the plants in a greenhouse because they are all subjected to chilling temperatures or ethylene or all fertilized with the wrong concentration of nutrients at the same time).

ABIOTIC DISEASE FACTORS:
PLANT ← ENVIRONMENT

Biotic diseases, on the other hand, are caused by micro-organisms, primarily. We call the organisms that cause diseases PATHOGENS. Pathogens may be fungi, bacteria, nematodes, viruses, or viroids. Many fungi, bacteria and nematodes are beneficial: only certain ones have a life style that uses living plants for food rather than living off of dead organic matter. Viruses, for the most part, are up to no good. Pathogens all act as PARASITES on their plant hosts, taking their food from the plant. As a result of this, plants show SYMPTOMS. The biotic diseases are all contagious, and it is their ability to spread (or to be spread by the movement of an insect or other organism that serves as a VECTOR) that makes them particularly dangerous in the greenhouse, where plants of one species are all close together and sometimes connected through irrigation. The symptoms of contagious diseases are often limited to one crop, or even to one cultivar, and tend to be scattered in a random pattern within a greenhouse, across a greenhouse bench or within a flat. This is because the INOCULUM (whatever form the pathogen takes to spread) is generally not evenly distributed.

BIOTIC (CONTAGIOUS) DISEASE FACTORS:




Contagious diseases are represented by a triangle – all 3 parts are essential! There must be the right plant, the right pathogen, and a favorable environment present all together in order for a disease to result. This is called THE DISEASE TRIANGLE.

Symptoms of plant diseases are different from the headaches, coughs and sneezes that humans exhibit when they are infected by a pathogen. Plants show symptoms such as leaf yellowing (chlorosis), leaf spots (dead areas in leaves), stem cankers (dead areas in stems), and stunting of leaves or flowers or internodes or of the whole plant. There can also be overgrowths (called GALLS) which appear as swellings on any plant part. Below ground, there may be root rot. When the roots are infected, symptoms of nutrient and water deficiency will show on above-ground parts of the plant.

DAMPING OFF describes disease of seeds or seedlings resulting in a poor stand soon after seeds are sown. At least 30 different fungi can cause damping-off. A fungal pathogen may attack after the seed imbibes water, before the shoot even emerges (PRE-EMERGENCE DAMPING OFF), or a seedling may be attacked soon after it develops a shoot above ground (POST-EMERGENCE DAMPING OFF) – while it is still very tender and thus easy to kill compared to a mature plant.

Plants can wilt simply because they lack water. But one of the types of contagious plant diseases is called a VASCULAR WILT, meaning that the xylem or phloem of the plant is attacked directly by the pathogen. The end result of this is often wilting, discoloration or stunting in a plant. Fungi such as species of *Verticillium* and *Fusarium* and bacteria such as species of *Xanthomonas* or *Ralstonia* are the most common causes of vascular wilt diseases. They are SYSTEMIC diseases and therefore considered very serious problems.

SPORES are the propagative units of fungi – analogous to a plant's seeds, and we often use them or the cases they are produced in to help us identify the fungus. In recent years, DNA and RNA sequencing have become more commonplace, giving us extraordinary power to determine the identity of organisms and to understand their relationship to other living things.

RUSTS and POWDERY MILDEWS are two special groups of diseases where you are able to see the pathogen itself and don't have to guess at the cause of symptoms. (In most cases the pathogen is hidden inside the plant). The rust fungi form colorful spores in containers called pustules on (usually) the undersurfaces of leaves – and we can see these with the naked eye. Powdery mildew fungi grow across the surface of the plant as hyphal strands, periodically inserting absorbing structures called HAUSTORIA into the epidermal cells for nourishment. As these fungi grow out from a single spore, they increase their hyphae in a circular pattern so that a visible white COLONY is formed; these colonies take on a sugary white appearance when thousands of spores are produced on their surface.

Diseased plants in the greenhouse may show a wide array of symptoms, and the scout is charged with noticing symptoms of abiotic disease (so that the injury will not be repeated) or biotic disease (so that it will not spread further and cause additional harm to the crop). Check plants on arrival—and continue to check them often until they are sold!

M. Daughtrey
1-25-23