BALLTECH ON DEMAND™

Ball Seed®

September 2024

TECH TRAINING:
PLANT HEALTH DIAGNOSTICS PART V: STEM & ROOT DISEASES

Stem and root diseases are common issues occurring in a wide variety of plants and production systems. There are numerous fungal, bacterial and viral pathogens that cause disease in roots, crowns and stems, many of which cause similar symptoms that can be challenging to distinguish. While pathogen identification can be difficult, recognizing disease symptoms can help inform control measures from a cultural, biological and chemical standpoint.

Tip 1: Describe Symptom Appearance and Distribution

- Disease symptoms tend to appear sporadically throughout a crop with varying levels of severity.
    - Are symptoms affecting a specific variety or species?
- Common signs and symptoms include:
    - Rot—Browning, discoloration and dead tissue.
    - Gall—"Tumor-like" growths and deformation.
    - Canker—Necrotic (dead) spots or lesions.
    - Sporulation—Reproductive fungal growth.
    - Mycelium—Web-like fungal growth.
    - Sclerotia—Hard fungal resting structures.
- ***NOTE: Always remember to look at the roots.***

Crown gall on rose from *Agrobacterium* infection.

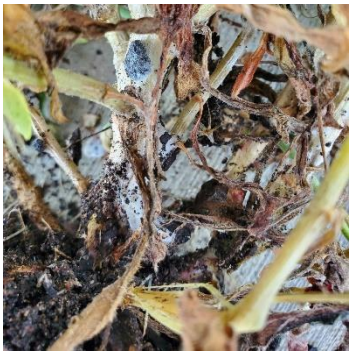
Tip 2: Consider the Environment and Vectors

- The pathogen, a susceptible host and a conducive environment are required to cause disease.
- Temperature, humidity and substrate moisture are key factors for disease development.
    - For example, *Pythium* and *Phytophthora* root rots spread under **wet** conditions.
    - *Thielaviopsis* infection is favored with **high substrate pH**.
- Diseases can spread from tools, pests and splashing water.
    - Damaged or weakened tissues are routes for infection.

Stem rot with white fungal sporulation or begonia.

Tip 3: Confirm with Lab Testing

- Know and recognize the common diseases of your crops.
    - Utilize effective chemical rotations for preventative control of root and crown rot.
    - Use appropriate cultural controls and provide an unfavorable environment for infection.
- If in doubt, send samples for lab-based diagnostics.
    - ***It is best to confirm the pathogen for proper treatment and control measures.***



White mycelium and black sclerotia. Photo Credit: Ball Helix Plant Disease Diagnostic Lab

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Root and Stem Diseases. Some of the main diseases observed on stems and roots include rot, galls, wilt and cankers. Many of these diseases are caused by fungal pathogens or the closely related oomycetes, but some are caused by bacterial pathogens. Maintaining good cultural practices is essential for limiting initial infection and can make it easier to spot diseased plants among a crop of otherwise healthy plants. While similar symptoms may be caused by an array of pathogens, maintaining a strategic and comprehensive chemical rotation can help to prevent stem and root diseases from becoming an issue.

Root Diseases. Root rot is one of the most common diseases observed in commercial floriculture production affecting a wide range of crops. Root rot diseases are typically caused by a fungus such as *Thielaviopsis*, *Rhizoctonia* or *Fusarium*, or an oomycete like *Pythium* or *Phytophthora*. Generally, root diseases cause brown or discolored, mushy roots, stunting, and wilting, even when the substrate is wet. Symptoms on the roots can vary based on the pathogen. For example, *Pythium* often causes the outer layer of the root to slough off while *Thielaviopsis* causes a distinct black coloration, hence the name "black root rot".

Crown Diseases. Galls and rot are common diseases that occur at the crown, or the base of the stem. Crown gall is a common disease caused by the bacterial pathogen *Agrobacterium tumefaciens*. There are no cures or chemical control measures. The best defense is good sanitation and quick removal and destruction of the infected plant material. Some pathogens that cause root rot like *Pythium* and *Phytophthora* can also cause crown rot. *Fusarium* and *Rhizoctonia* can cause distinct symptoms above the substrate such as white or pink fungal growth on stems from Fusarium or web-like mycelium and cankers on the lower stem and leaves with *Rhizoctonia*. *Sclerotium rolfsii*, the pathogen causing southern blight produces symptoms of root and crown rot accompanied by white fungal growth and sclerotia near the base of the stem.

Stem Diseases. Stems can also develop galls, rot, vascular wilt and stem cankers. Leafy gall is a disease that causes masses of shoots to develop in dense clusters caused by the bacterial pathogen *Rhodococcus fascians*. Like with Agrobacterium, there are no cures or chemical control measures. Fungal and bacterial pathogens may cause dead spots or cankers to form on the stem, often infecting though a wound left by mechanical damage or pest feeding. Vascular wilts are caused by fungal or bacterial pathogens that infect the xylem or phloem, causing sections of the plant to die off. *Fusarium* and *Verticillium* are two common fungi that cause vascular wilts. Dissecting the stem will reveal discoloration in the vascular system. *Sclerotinia* is a soilborne pathogen that produces white, cottony growth on the stem and hard, black sclerotia in or on the surface of the stem.

Pathogen Testing and Corrective Measures. Testing is the best way to correctly identify and treat diseases when symptoms are observed. While ImmunoStrips are available for in-house testing, these tests are typically intended for pathogens causing foliar diseases. Diagnostic labs such as the labs at Ball Helix can perform tests to determine the specific pathogen which can help in deciding the appropriate corrective actions one should take. Industry technical experts and university extension services can also aid with diagnostics—be sure to use the resources available to assist with root and stem diseases.

For more information, check out these additional resources:

Tech On Demand. Plant Health Diagnostics Part I: Identifying Symptoms.
Michigan State University. The basics of diagnosing greenhouse floriculture problems.