August Gardening Workshop: Pathogens and IPM

What are Pathogens?

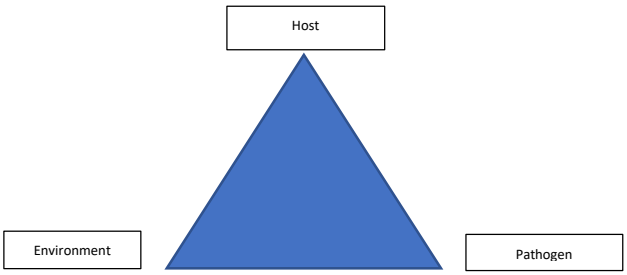
- A pathogen is an infectious organism capable of causing disease.
- Fungi, bacteria, viruses, phytoplasmas and nematodes can all be plant pathogens.
- Fungi is the most common plant pathogen.

What is IPM?

- Integrated Pest Management
- A decision-making framework using research-based pest management information.
- The best IPM programs focus on fixing the underlying conditions that lead a pest to cause damage rather than just killing, eliminating or controlling the pest itself.

A pathogen is not a plant disease. A plant disease is the impairment of normal plant growth and function as the result of a continuous negative interaction with a pathogen. A disease is a continuous infection.

In order for a disease to occur, three factors must be present: The host plant, the pathogen, and the environmental conditions favorable for disease development. Think of it as a Disease Triangle. Most plants are susceptible to attack by some pathogens.



So why do I need to know this?

Simple Answer: This is good to know so your plants remain healthy, produce desired fruits/vegetables/flowers and so that you can continue to grow your gardens with less stress and more enjoyment.

The Infection Cycle

- The infection cycle describes how disease develops when a pathogen encounters a susceptible host under favorable environmental conditions.
  1. Infection: The pathogen encounters the host and attacks.
  2. Growth: The pathogen utilizes nutrients from the plant and begins to grow and spread throughout the plant tissue.
  3. Symptom Expression: The pathogen has colonized, and the plant is negatively affected, and symptoms show (yellowing leaves, dieback, leaf spotting, etc.)
  4. Reproduction: The pathogen reproduces. The new pathogen can move onto healthy plants and the cycle begins all over again.

Steps 1 and 2 of the infection cycles will not be visible! We will not know there is an infection yet.

The first and most important step in managing disease in the yard and garden is identifying exactly what pathogen is causing the problem. Look for signs and symptoms:

- A **SIGN** is a visible part of the pathogen. (signs help to tell us 'who' the pathogen is)
- A **SYMPTOM** is a visible change in the plant's normal appearance.

Types of Pathogens

Fungi

- The most common pathogen
- Are dispersed about the environment as spores or mycelia (vegetative part of a fungus)
- Often enter plant tissue through wounds or natural openings
- Need living tissue to survive

Bacteria

- Are single celled, microscopic organisms
- Reproduced by fission – the division of one bacterial cell into two identical cells (bacteria can double in population in 20 minutes)
- Favor high humidity and free moisture

Phytoplasma

- Single celled, microscopic organisms
- Similar to bacteria but they do not have a cell wall and are significantly smaller
- Infect a plant's phloem cells (cells in a plant's vascular system that are responsible for transferring plant nutrients)
- Transferred from plant to plant by splashing water, insects, garden tools, etc.
- Invisible cause – Invisible disease

Virus

- Smallest plant pathogen
- Consists only of genetic material (DNA or RNA) and a protein coat
- Lives in the plant cells
- Needs a host cell to reproduce

Nematodes

- Animals! Small round worms that live in water, soil, or as parasites inside plants and animals
- Begin their lives as eggs and go through four juvenile stages before becoming adults
- Have a stylet (specialized piercing mouthpiece) used to puncture plant cells

So now that we know all of these terms, what's next?

Management and Education

- Read seed packets
- Immune, Resistant, and Tolerant plants will be listed on seed packets
    - Immune – will not become infected even if the pathogen is present
    - Resistant – the genetic make-up blocks or represses the pathogen
    - Tolerant – will become infected but the disease will not affect the growth or productivity
- Sanitation
    - Remove the infected plants or plant parts
    - Clean and disinfect garden tools
- Eradication
    - The complete elimination of a pathogen (this is almost impossible in a garden setting)
- Chemical Control – **READ THE LABEL**
    - Pesticides
        - Any substance that will repel, control, kill, mitigate or otherwise *manage* a pest
        - Anyone who handles pesticides has a public responsibility towards health, environment and safety
        - Products applied to a plant in order to prevent, suppress or kill a pest
    - Fungicides
        - Only control fungal pathogens
    - Nematicide
        - Control nematodes, highly toxic and not commonly available to gardeners
    - Most fungicides are preventative
        - Contact fungicides act by creating a barrier on the plant surface
        - Systemic fungicides are absorbed into and move through the plant tissue