General aspects of soilborne phytopathogenic fungi

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Introduction

Soilborne pathogens → major crop yield losses.

Pathogen groups: fungi, oomycetes, viruses, bacteria, nematodes.

Fungal diseases = most difficult to control.

Soilborne pathogens are a huge challenge in agriculture, causing heavy crop losses worldwide. They include fungi, oomycetes (fungus-like organisms), viruses, bacteria, and nematodes. Among them, **fungi are especially important** because they survive well in soil and are hard to eradicate once established.

Survival of Soilborne Pathogens

Survive part of life cycle in soil.

Soil = heterogeneous environment.

Microbial growth limited by organic substrates.

Soilborne fungi can persist for long periods in the soil by forming resistant structures like spores or sclerotia. Soil itself is a complex environment, with different textures, nutrients, and moisture. Microbes compete for organic matter, which is often scarce — this shapes pathogen survival and aggressiveness.

Major Soilborne Fungal Pathogens

Common genera:

- **Fusarium**
- **Rhizoctonia**
- **Verticillium**
- **Pythium**
- **Phytophthora**

Broad host range → attack many crops.

Some of the most problematic fungi include *Fusarium*, *Rhizoctonia*, *Verticillium*, *Pythium*, and *Phytophthora*. These pathogens cause a range of diseases affecting roots, stems, and vascular systems. Many have a **broad host range**, meaning they infect multiple crops, making rotation and control difficult.

Importance of Soil Care

Good soil care = long-term investment.

Healthy soil reduces pathogen pressure.

Practices: crop rotation, organic matter management, good drainage.

Managing soil health is crucial for disease prevention. Practices like crop rotation, avoiding compaction, improving drainage, and adding organic matter can reduce pathogen survival. Soil health management is not a quick fix but a **long-term necessity** for sustainable farming.

Soilborne Diseases

Damping-off → pre- & post-emergence.

Root rots → destroy root systems.

Vascular wilts → block water & nutrients.

Soilborne fungi cause different types of diseases. Damping-off kills seedlings before or after emergence. Root rots affect plants later by destroying root tissues. Vascular wilts invade the water-conducting tissues, leading to systemic wilting and often plant death.

Pre-emergence Damping-off

Seeds rot before emerging.

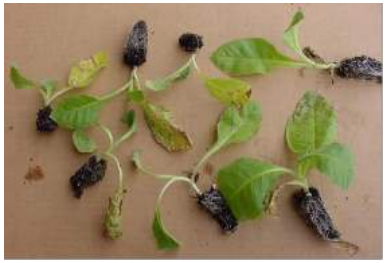
Caused by *Fusarium*, *Pythium*, *Rhizoctonia*.

Favors poor soil conditions:

- Cold, hot, or very wet soil.
- Poor drainage.
- Undecayed organic matter.

In pre-emergence damping-off, seeds and seedlings die underground before appearing. Conditions that stress seeds (like extreme temperatures or waterlogged soil) favor fungal invasion. Farmers may mistake it for poor germination, but the real cause is pathogen attack.

Post-emergence Damping-off



Symptoms:

- Root decay, stem rot at soil line.
- Water-soaked, mushy tissues.
- Brown, gray, or black lesions.

Severe infections → girdled stems, seedling death.

Post-emergence damping-off attacks young seedlings after sprouting. Lesions appear on roots or lower stems, causing tissues to rot. Severe lesions can girdle the stem, cutting off water flow, leading to wilting, collapse, and death. It’s a major issue in nurseries and greenhouses.

Root Rot

Caused by *Phytophthora*, *Chalara elegans*.

Fungi invade internal root tissue.

Above-ground symptoms:

- Reduced vigor, yellowing, wilting.
- Leaf drop, twig dieback, sudden death.

Root rot extends beyond seedlings, attacking older plants. Pathogens destroy root tissues, reducing the plant's ability to take up water and nutrients. Farmers often notice yellowing leaves or wilting, but the real problem lies underground in the rotting roots.

Vascular Wilts

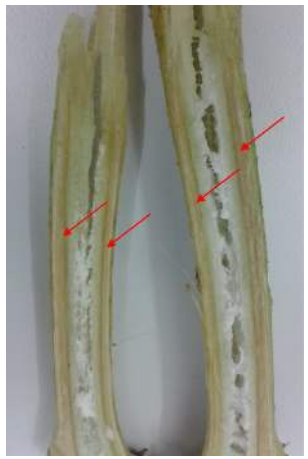
Caused by fungi (*Fusarium*, *Verticillium*) & bacteria.

Attack xylem (water-conducting tissues).

Symptoms:

- Plant wilting.
- Discoloration of vascular tissues.

Vascular wilt diseases are particularly destructive. The fungi grow inside the xylem vessels, blocking water transport. As a result, plants wilt even when soil moisture is adequate. Cutting open the stem often shows brown discoloration in the vascular tissue.



Conclusion

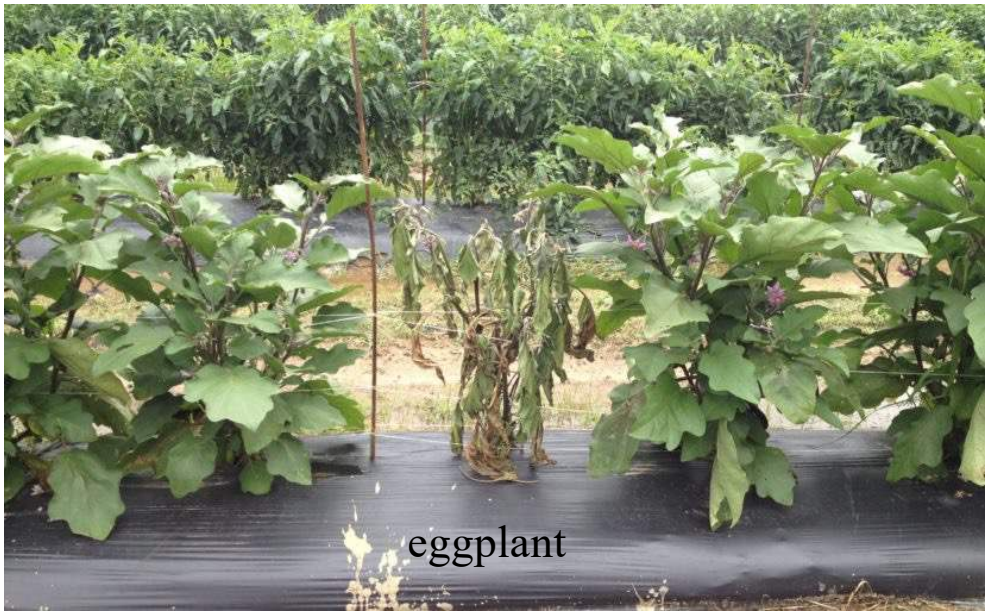
CSoilborne fungi = persistent & destructive.

Diseases: damping-off, root rots, vascular wilts.

Management: long-term soil care & integrated practices.

Soilborne fungal pathogens survive for years in soil, making them difficult to eliminate. Their diseases — damping-off, root rots, and vascular wilts — limit yields of many crops. The best defense is long-term soil management combined with integrated practices like resistant varieties, rotation, and good hygiene.


watermelon


eggplant


potato