



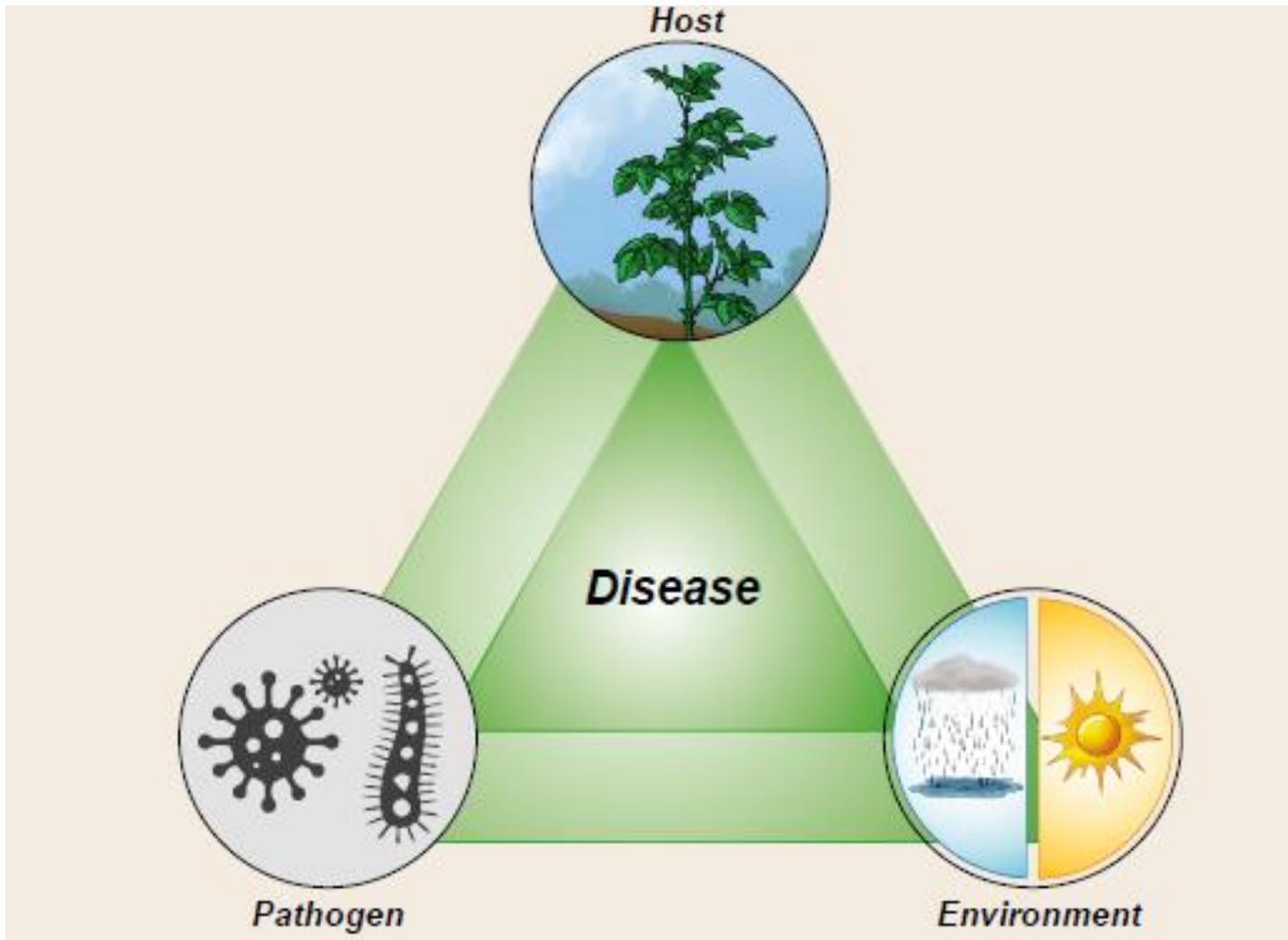
MODULE 3: Potato pest and disease management



Module 3 Outline

- 3.1. The disease triangle
- 3.2. Controlling late blight
- 3.3. Controlling bacterial wilt
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- 3.7. Controlling nematodes
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3.1. The disease triangle



The disease triangle

- **Pests and diseases** in potato reduce tuber quality causing up to 100% yield losses.
- A nexus of three factors are conducive to pests and diseases in the field and in storage:
 - ✓ a crop attacked by pests and diseases,
 - ✓ the **pathogen** or pest (organism causing disease or damage), and
 - ✓ the **environment** (conditions that favor the pathogen or pest).

Cont'd...

The disease triangle

- A pathogen can be lodged in the plant or tuber for a long time without symptoms (**latent infection** – e.g., bacterial wilt).
- Late blight, bacterial wilt, soft rot (or blackleg), viral diseases, potato tuber moth, and nematodes are some harmful diseases and pests.
- Pest/disease control strategy: Break the harmful nexus.

3.2. Controlling late blight



Causal agent and symptoms

- Caused by the fungus *Phytophthora infestans*, can lead to crop failure.
- Tell-tale signs:
 - ✓ On leaves: Large, irregular brown spots that dry out,
 - ✓ On stems: Weakened stems, and
 - ✓ On tubers: Brown patches of dry rot around the edges.
- Severe infestation occurs at high relative humidity (>90%) and cool temperature (<22°C).
- Spreads swiftly in the field.

Steps to control late blight

- Timely spraying of two major groups of chemicals to prevent infection and kill the pathogen after infection:
 - **Contact fungicides** kill by contact. Examples: Mancozeb, Pencozeb, Balear (Tropic), Plantineb, Manesam, Mancobex, and Mancozan.
 - **Systemic fungicides** enter the plant and kill the pathogen. Examples: Ridomil (Gold and Plus), Fungi-Pro, Fungicur, Monchamp, Metalm 75 WP, Metrostar and Parastar.
- Planting less susceptible varieties.

Spraying schedule

- Use a contact fungicide after plant emergence.
- Spray around 3 g/liter (45 – 50 g/sprayer) of a systemic fungicide 2 weeks later; dosage can vary.
- Subsequent sprays: Contact fungicides at 2-week intervals until the canopy turns yellow (maturity). If disease symptoms are visible in the field, spray a systemic fungicide (a maximum of twice per season for less susceptible varieties).

3.3 .Controlling bacterial wilt



Causal agent and mode of infection

- Bacterial wilt is both a soil and seedborne disease caused by *Ralstonia solanacearum*.
- Infects the crop at all stages causing crop failure.
- Can also spread via infected seed, water, roots, soil, farming tools, livestock and people.
- Also affects plants such as chili, tomato, tobacco, black nightshade and eggplant, and several weed species.
- Not every wilt is caused by bacterial wilt.

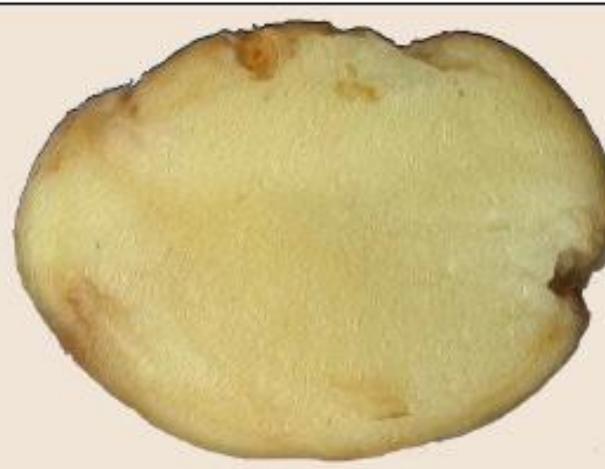
Classic symptoms

- On immersing a small bit of the stem's base in a glass of water, bacteria oozes from the stem and a downward movement in the water will occur.
- Black or brown rings when a tuber is cut in half.
- Bacteria oozing from tuber eyes, revealed by soil sticking to tuber eyes when the crop is harvested.

Controlling bacterial wilt

- There is no commercial chemical to control bacterial wilt.
- Cultural practices are the answer:
 - ✓ Plant bacterial wilt-free seed,
 - ✓ Crop rotation with crops that don't belong to the potato family, such as cereals (maize as first rotation crop)
 - ✓ Uproot wilting plants and soil around roots,
 - ✓ Clean tools before and after use,
 - ✓ In serious infestations, plant non-host plants for more than 5 years, and
 - ✓ Remove potato volunteers.

3.4. Controlling soft rot or blackleg



Causes and symptoms

- Caused by a unique bacterium (*Pectobacterium atrosepticum*) that changes tuber tissue into liquid; high humidity aids infection.
- Infected tuber: Decay in one spot spreads rapidly, resulting in rotting tissue that is mushy, slimy and water soaked.
- Infected tubers rot either in the field or in storage and produce a foul smell.
- **Black lesions** at the base of the stem; affected tissue becomes soft and water soaked under humid conditions and then the plant collapses.

Controlling soft rot (blackleg)

- Control is through a recommended integrated approach.

3.5. Controlling viral diseases



Viruses are tough to spot

- Viral diseases are difficult to recognize in the field.
- Mild infections can show no signs of disease at all.
- More than one type of virus can infect the field or plant.
- Potato leafroll virus: Infected plants have leaflets curling upward, turn pale yellow and feel brittle and fragile.
- Good fertilization / irrigation increases resistance to viruses.

What to watch out for

- Differentiate between a healthy and diseased plant.
- Viruses result in smaller potato tubers which farmers unknowingly mistake for seed, leading to reduced yields during subsequent seasons (**seed degeneration**).

Controlling viral diseases

- A mix of practices can control viral diseases in potatoes:
 - ✓ Using clean/certified seed,
 - ✓ Controlling insects that spread viral diseases (insecticides, traps, predators, etc.),
 - ✓ Planting varieties that are less susceptible to viral diseases, and
 - ✓ Uprooting and destroying non-potato plants which can attract and host vectors of viral diseases.

3.6. Controlling potato tuber moth



Symptoms to look out for

- Potato tuber moths (potato tuber worms) infest the crop in the field and move with tubers to the store.
- Moth larvae penetrate tubers through the eyes and create twisting **tunnels** in the tubers.
- They reproduce continuously in stored potatoes causing huge losses.
- They display fewer characteristic tunnels in stores but they have clearly visible **excreta**, mainly at the eyes. Often, these tubers become drier than healthy ones.

Preventing infestation

- Avoid planting in too light and loose soil.
- Deep planting or high hillling up protect the tubers.
- Decontaminate storage rooms prior to storing.
- Inspect the tubers carefully before and during storage and remove tubers showing openings/galleries and/or excreta.
- Use natural repellent plants such as **Lantana**.

Controlling the potato tuber moth

- ✓ Spraying the field with appropriate insecticides
 - The first treatment starts right after plant emergence.
 - Subsequent treatments are done at regular intervals of 2-3 weeks.
 - Combining fungicides and insecticides is more economical.
 - In dry weather, irrigation is a good preventative measure against these worms.

3.7. Controlling nematodes



Types, symptoms and marketability

- Potato cyst nematodes:
 - ✓ Impair plant growth, reducing it to dwarf,
 - ✓ May turn yellow and show signs of wilting, and
 - ✓ In the long run, tubers decrease in size causing reduction in yield.
- Root-knot nematodes (widespread):
 - ✓ Attack tubers causing blemishes, and
 - ✓ Make tubers unmarketable.
- Tubers containing nematodes are edible.
- Infested potatoes are more susceptible to bacterial wilt.

3.8. Safe use of chemicals



When to use chemicals

- Maintain pest populations and disease severity at acceptable levels
- Keep pesticides to levels that are economically justified and safe for human/environmental health.
- Use chemicals after exhausting cultural or biological control:
 - ✓ Natural predators,
 - ✓ Varieties with pest/disease resistance,
 - ✓ Healthy seed potatoes,
 - ✓ Rotation with other crops, and
 - ✓ Organic pesticides (e.g., neem).

Safe use of chemicals

- Strictly follow the manufacturer's instructions on dosage, spraying and frequency of application.
- Wear recommended protective gear while spraying.
- Misuse of pesticides can lead to poisoning.
- Strictly avoid spraying crops before harvest. **No fungicides or insecticides should be applied during the last 2-3 weeks of the crop.**
- Ensure the safe disposal of chemical containers.



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