



**FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES**

**DISEASES OF FIELD CROPS PPA - 301**

## LECTURE 14

### 1. Black shank - *Phytophthora parasitica* var. *nicotianae*

#### Symptoms

The pathogen may affect the crop at any stage of its growth. Even though all parts are affected, the disease infects chiefly the roots and base of the stem. Seedlings in the nursery show black discolor of the stem near the soil level and blackening of roots, leading to the wet rot in humid condition and seedling blight in dry weather with withering and drying of tips. The pathogen also spreads to the leaves and causes blighting and drying of the bottom leaves. In the transplanted crop, the disease appears as minute black spots on the stem, spreads along the stem to produce irregular black patches and often girdling occurs.

The upward movement leads to development of necrotic patches on the stems.

The infected tissues shrink, leaving a depression and in advanced condition the stem shrivels and plant wilts. When the affected stem is split open, the pith region is found to be dried up in disc-like



plates showing black discoloration. On the leaves large brown concentrically zonate patches appear during humid weather, leading to blackening and rotting of the leaves.

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#### Pathogen

The fungus produces hyaline and non-septate mycelium. The **sporangia**, which are hyaline, thin walled, ovate or pyriform with papillae, develop on the **sporangiophores** in a sympodial fashion. Sporangia germinate to release zoospores which are usually kidney shaped, biciliate and measure 11-13 x 8-9  $\mu$ m. The fungus also produces globose and thick walled **chlamydospores**, measuring 27-42  $\mu$ m in diameter. **Oospores** are thick walled, globose, smooth and light yellow coloured, measuring 15-20  $\mu$ m in diameter.



### **Favourable Conditions**

- Frequent rainfall and high soil moisture.
- High population of rootknot nematodes *Meloidogyne incognita* var. *acrita*.

### **Disease cycle**

The fungus lives as a saprophyte on organic wastes and infected crop residues in soil. The fungus is also present in the soil as dormant mycelium, oospores and chlamydo spores for more than 2 years. The primary infection is by means of oospores and chlamydo spores in the soil. Secondary spread is by wind-borne sporangia. The pathogen in the soil spreads through irrigation water, transport of soil, farm implements and animals.

### **Management**

- Cover the seed beds with paddy husk or groundnut shell at 15-20 cm thick layer and burn.
- Provide adequate drainage in the nursery. Drench the nursery beds with 1 per cent Bordeaux mixture or 0.2 per cent Copper oxychloride, two days before sowing.
- Spray the beds two weeks after sowing with 0.2 per cent Metalaxyl or 0.2 per cent Captafol or 0.2 per cent Copper oxychloride or 1 per cent Bordeaux mixture and repeat after 10 days.

## **2. Tobacco mosaic - *Tobacco mosaic virus* (TMV)**

### **Symptoms**

The disease begins as light discoloration along the veins of the youngest leaves. Soon the leaves develop a characteristic light and dark green pattern, the dark green areas associated more with the veins, turning into irregular blisters.

The early infected plants in the season are usually stunted with small, chlorotic, mottled and curled leaves. In severe infections, the leaves are narrowed, puckered, thin and malformed beyond recognition. Later, dark brown necrotic spots develop under hot weather and this symptom is called “Mosaic burn” or “Mosaic scorching”.



**Pathogen**

The disease is caused by *Tobacco mosaic tobamovirus*. It is a rigid rod measuring 300 X 150-180 nm with a central hollow tube of about 4nm diameter with ssRNA as its genome.

**Disease cycle**

The virus spreads most rapidly by contact wounds, sap and farm implements and operators. The virus remains viable in the plant debris in the soil as the source of inoculum as the longevity of the virus is very high. It is capable of remaining infective when stored dry for over 50 years. The virus has a wide host range, affecting nearly 50 plant species belonging to nine different families. The virus is not seed-transmitted in tobacco but tomato seeds transmit the virus. No insect vector known to transmit the virus.

**Management**

- Remove and destroy infected plants.
- Keep the field free of weeds which harbour the virus.