RAMA UNIVERSITY

www.ramauniversity.ac.in

FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

DISEASES OF FIELD&HORTICULTURAL CROPS&

Management 1 PPA - 312

LECTURE 07

1. NAME OF DISEASE – DAMPING OFF

Pathogen-Pythium aphanidermatum

Symptoms

- ✓ Damping off of tomato occurs in two stages, i.e. the pre-emergence and the post-emergence phase.
- ✓ In the pre-emergence the phase the seedlings are killed just before they reach the soil surface.
- ✓ The young radical and the plumule are killed and there is complete rotting of the seedlings.
- ✓ The post-emergence phase is characterized by the infection of the young, juvenile tissues of the collar at the ground level.
- ✓ The infected tissues become soft and water soaked. The seedlings topple over or collapse.

Healthy plant

Affected plant

Affected seedling

Favourable conditions

- ✓ High humidity, high soil moisture, cloudiness and low temperatures below 24° C for few days are ideal for infection and development of disease.
- ✓ Crowded seedlings, dampness due to high rainfall, poor drainage and excess of soil solutes hamper plant growth and increase the pathogenic damping-off.

Survival and spread

Primary: Soil, Seed, Water

Secondary: Conidia through rain splash or wind.

Management

- ✓ Used raised seed bed
- ✓ Provide light, but frequent irrigation for better drainage.
- ✓ Drench with Copper oxychloride 0.2% or Bordeaux mixture 1%.
- ✓ Seed treatment with fungal culture Trichoderma viride (4 g/kg of seed) or Thiram (3 g/kg of seed) is the only preventive measure to control the pre-emergence damping off.
- ✓ Spray 0.2% Metalaxyl when there is cloudy weather

2. NAME OF DISEASE – WILT

Pathogen:Fusarium oxysporum f. sp. lycopersici

Symptoms

- The first symptom of the disease is clearing of the veinlets and chlorosis of the leaves.
- The younger leaves may die in succession and the entire may wilt and die in a course of few days. Soon the petiole and the leaves droop and wilt.
- In young plants, symptom consists of clearing of veinlet and dropping of petioles. In field, yellowing of the lower leaves first and affected leaflets wilt and die.
- The symptoms continue in subsequent leaves. At later stage, browning of vascular system occurs. Plants become stunted and die.

Healthy plant

Affected plants

Life Cycle

Fusarium fungi survive in the soil or associated with plant debris for up to ten years. Disease development is favored by warm soil temperatures, and symptoms are most prevalent when temperatures range from 80–90 degrees F. The fungi enter the plants through their roots and are then spread throughout the plant by the plant's water-conducting vessels.

Management

- The affected plants should be removed and destroyed.
- Spot drench with Carbendazim (0.1%)
- Crop rotation with a non-host crop such as cereals.

3. NAME OF DISEASE – EARLY BLIGHT

Pathogen- Alternaria solani

Symptoms

- This is a common disease of tomato occurring on the foliage at any stage of the growth.
- The fungus attacks the foliage causing characteristic leaf spots and blight. Early blight is first observed on the plants as small, black lesions mostly on the older foliage.
- Spots enlarge, and by the time they are one-fourth inch in diameter or larger, concentric rings in a bull's eye pattern can be seen in the center of the diseased area.
- Tissue surrounding the spots may turn yellow. If high temperature and humidity occur at this time, much of the foliage is killed.
- Lesions on the stems are similar to those on leaves, sometimes girdling the plant if they occur near the soil line.
- Transplants showing infection by the late blight fungus often die when set in the field. The fungus also infects the fruit, generally through the calyx or stem attachment.
- Lesions attain considerable size, usually involving nearly the entire fruit; concentric rings are also present on the fruit.

Early symptom

Affected plant at advanced stage

Concentric ring on infected leaf

Management

- Removal and destruction of crop debris.
- Practicing crop rotation helps to minimize the disease incidence.
- Spray the crop with Mancozeb 0.2 % for effective disease control.

4. NAME OF DISEASE – LATE BLIGHT

Pathogen

-Late blight is caused by the oomycete Phytophthora infestans. Oomycetes are fungus-like organisms also called water molds, but they are not true fungi.

There are many different strains of P. infestans. These are called clonal lineages and designated by a number code (i.e. US-23). Many clonal lineages affect both tomato and potato, but some lineages are specific to one host or the other.

The host range is typically limited to potato and tomato, but hairy nightshade (Solanum physalifolium) is a closely related weed that can readily become infected and may contribute to disease spread. Under ideal conditions, such as a greenhouse, petunia also may become infected.

Signs and symptoms

- Leaf infections are large brown blotches with a green gray edge
- Leaves have large, dark brown blotches with a green gray edge; not confined by major leaf veins.
- Infections progress through leaflets and petioles, resulting in large sections of dry brown foliage.
- Stem infections are firm and dark brown with a rounded edge.
- Firm, dark brown, circular spots grow to cover large parts of fruits. Spots may become mushy as secondary bacteria invade.
- In high humidity, thin powdery white fungal growth appears on infected leaves, fruit and stems.

Infected fruit have a dry brown rot

In high humidity, powdery white spores form on infected fruit, leaves and stems

- In cool, wet weather, entire fields turn brown and wilted as if hit by frost.

Environment

- Spreads most in cool (60°F to 70°F), damp weather.
- Prolonged hot dry days can halt pathogen spread.

Biology and disease cycle

Phytophthora infestans can overwinter in Minnesota if protected in potato cull piles. Overwintering in a tomato production system is unlikely but infected tomato fruits may give rise to infected volunteer seedlings the following season.

The most common routes of introduction each season are infected potato seed tubers, infected tomato transplants shipped in from other regions, or windblown sporangia (asexual spores) from the south.

Under cool, wet conditions, P. infestans can infect and produce thousands of sporangia per lesion in less than five days. These sporangia easily become air-borne, resulting in prolific spread of the pathogen.

The disease can potentially destroy entire fields in a short period of time if left unmanaged. Long-distance spread to other fields is also likely, particularly under cloudy conditions.

Management

- Plant resistant cultivars when available.
- Remove volunteers from the garden prior to planting and space plants far enough apart to allow for plenty of air circulation.
- Water in the early morning hours, or use soaker hoses, to give plants time to dry out during the day — avoid overhead irrigation.
- Destroy all tomato debris after harvest.

If symptoms are observed, treat plants with one of the following fungicides:

- Apply a copper based fungicide (2 oz/ gallon of water) every 7 days or less, following heavy rain or when the amount of disease is increasing rapidly. If possible, time applications so that at least 12 hours of dry weather follows application.

5. NAME OF DISEASE – BUCK EYE ROT

Pathogen –Phytophthora nicotianae

- Immature fruits (green colour) irrespective of their development stages are susceptible.

- Water soaked light brown discoloured spots appear which increase readily showing concentric dark brown rings slightly resembling the markings as a buckeye.
- The lesions rapidly enlarge and within 3-4 days, whole of the fruit surface turns dark brown and feels soft to touch.
- In warm and humid weather, white flocculent superficial growth of the fungus consisting of sporangia and sporangiophores also develops on the diseased fruits.
- Later, these fruits may drop off from the plant .

Pathogen:

- The disease is caused by *Phytophthora nicotianae* Breda de Hann. var. *parasitica* (Dastur) Waterhouse.
- The mycelium of the pathogen is hyaline and coenocytic with branching typically at right angles. The sporangiophores arise from hyphal threads and produce sporangia.
- The sporangia are broadly ovoid to globose in shape having one hemispherical papilla at the tip. Chlamydospores are smooth, globose, and slightly yellowish with thick brown

walls, produced abundantly in culture and germinate by producing zoospores or germ tubes.
- Antheridia are amphigynous, spherical or oval and oogonia are rough, thick walled and yellowish brown in colour.
- Oospores are aplerotic, 18 to 20 µm in diameter with 2 µm thick wall.

Disease cycle and epidemiology
- The fungus overwinters in the soil in the form of oospores or chlamydospores and can remain active in soil for at least one year without the support of a susceptible host (Fig.1.).
- With the onset of monsoon rains, in the presence of high soil moisture and moderate temperatures (20-25°C), the chlamydospores and oospores start germinating by producing mycelium and sporangia.
- The sporangia in turn produce biflagellate zoospores, which are splashed by rain to the fruits.
- The symptoms develop on fruits after 3-4 day of infection.
- Infected fruit become mummified and fall down on the ground.
- The sporangia produced on infected fruits, liberate zoospores which are again splashed by rain and cause secondary infection.
- Maximum fruit infection under field conditions occurs at a temperature range of 20-25°C, RH > 80 per cent and high rainfall conditions.
- Higher doses of N resulted in higher fruit rot while higher levels of P resulted in more yield of healthy fruits and less fruit rot.

Forecasting:

- Based on weekly temperature and cumulative rainfall, short term forecasting of the disease can be done. June 20 is considered as the zero date.
- The disease is not expected to occur at temperatures at or below 20°C, though at temperatures of 22.5°C or above even a slight rainfall (10 mm) will result in disease appearance, which is expected to appear after 4 days of infection.

Management

- Stake the plants erect and remove foliage and fruit up to a height of 15-20 cm to avoid moist and stagnant air conditions.
- Collect and destroy the affected fruits regularly.
- Apply pine needle/grass mulch on the field floor to create a barrier between the host and soil borne inoculum.
- With the onset of monsoon rains, spray the crop with metalaxyl + mancozeb (0.25%) followed by sprays of either mancozeb (0.25%) or copper oxychloride (0.3%) or Bordeaux mixture (4:4:50) and repeat at 7-10 days interval.

6. NAME OF DISEASE – LEAF CURL

Pathogen:

- The disease is caused by *Tobacco yellow leaf curl virus* (TYLCV) which belongs to the Gemini Virus group.

- The particles are geminate, non-enveloped, 18 nm in diameter and genome consists of single stranded DNA.

Symptoms:

- The major symptoms include chlorosis of leaflets and reduction in their size accompanied by curling inwards.
- Significant reduction of nodes and internodal lengths occurs giving the plant a bushy appearance.
- In advanced stages of infection severe stunting and partial to complete sterility occurs. Infected plants bear few or no fruits.

Disease cycle and epidemiology:

- The virus is transmitted through grafting but not through sap, contacts between plants or seeds. The sole agency of its transmission is the white fly Bemisia tabaci that transmits the virus in a persistent manner.
- The virus has a wide host range including cultivated species, weed hosts and ornamentals.

Management

- Use resistant variety Lycopersicon perurvianum, Akara ananya
- Do not smoke near field
- Use of systemic insecticide such as Dimethoate (0.05 %)

7. NAME OF DISEASE – TOMATO MOSAIC

Pathogen:

- *Tomato mosaic virus* (ToMV) is a member of Tobamo virus group.
- ToMV is an RNA-containing virus with straight rod particles about 300 x 18 nm.

Symptoms:

- Mosaic is characterized by presence of dark and light green patches on the leaflets which may get distorted and puckered (Plate -3).
- Malformation and reduction in leaf size may also occur. In case of early infection the plants are reduced in size and remain stunted.

Disease cycle and Epidemiology:

- Virus transmission in the field either occurs through contact between plants and field implements.

- The other modes of transmission are through sap and grafting but there is no vector involved.
- The virus is externally seed borne. The infection occurs during transplanting and the virus has a wide host range.

Management

- Use seed from healthy plants only
- Use a minimum 2 year rotation
- Remove diseased plants from the field as soon as virus symptoms are noticed
- Disinfect tools, stakes and equipment before moving from diseased areas to healthy areas.
- Use steam pasteurized soil in a greenhouse