



DISEASES OF POTATO CROP

Session-15

M.S.Swaminathan School of Agriculture,CUTM



LATE BLIGHT OF POTATO

INTRODUCTION

Centurion UNIVERSITY

Shaping Lives...

Empowering Communities

• Infection starts in **6 weeks old plants**.

• First reported from Andes mountains of South America.

- It cause famine in 1845 in Ireland of Europe.
- In India, the disease was first reported in Darjeeling district in India (1880)

SYMPTOMS

- Initially starts as water soaked ,light brown lesions on the leaf blade. In favourable climatic condition disease spread to leaflet and petiole.
- Characteristic lesions are roundish with concentric marking in margin. The lesion generally appear in leaf margin.
- The lesions are dirty brown colour in beginning ,later stage turn black.
- Downy growth of the pathogen on subsequent lower surface.
- Progressive defoliation and collapse of plants under favourable conditions.
- Water soaked stripes appear on stem which becomes necrotic.
- Purplish brown spots appear on skin of tubers.
- On cutting, the affected tubers show rusty brown necrosis spreading from surface to the centre.
- Decay of plant parts under favourable weather which emits foul smell.



Cont...

CAUSAL ORGANISM

Phytophthora infestans

UNIVERSITY

Shaping Lives...
Empowering Communities...

both inter- and intra-cellularly present in host and spreads by feely branching,hyaline,coenocytic hyphae.

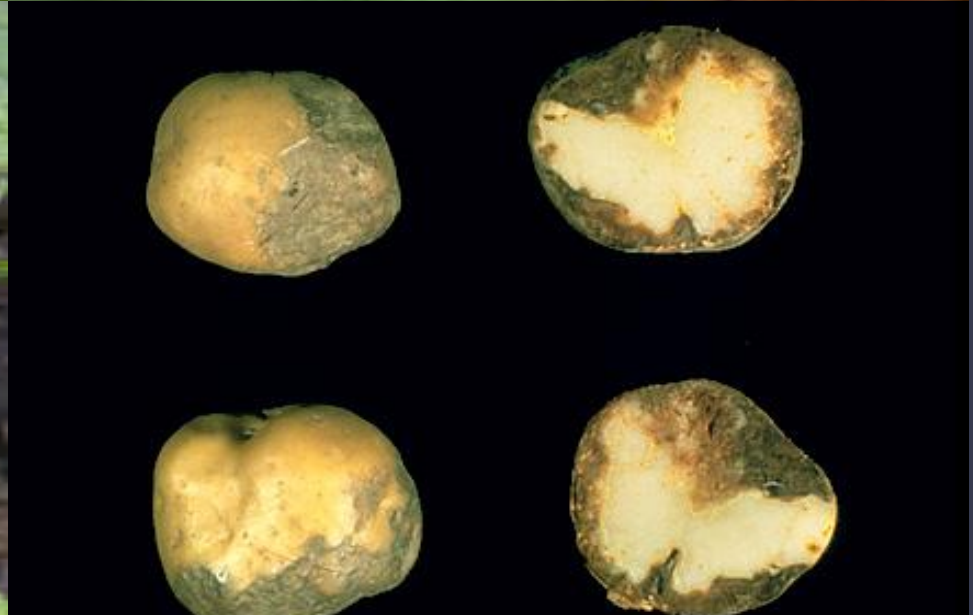
- Sporangiphores emerge in cluster through the stomata and bear a hyaline,thin walled,lemon shaped,papillate sporangia.
- The sporangia spread though wind which germinate through germ tube and cause further infection.
- As disease advances it produce the thick walled oospore from which sporangia produce which contain biciliate sporangiospore.

DISEASE CYCLE

- P.I: Infected potato tubers or oospores.
- Collateral host: Tomato (*Lycopersicon esculentum*), *Pepper and egg plant*.
- S.I: Sporangia dispersed by wind or water.



PHYTOPHTHORA INFECTION IN LEAF AND TUBER

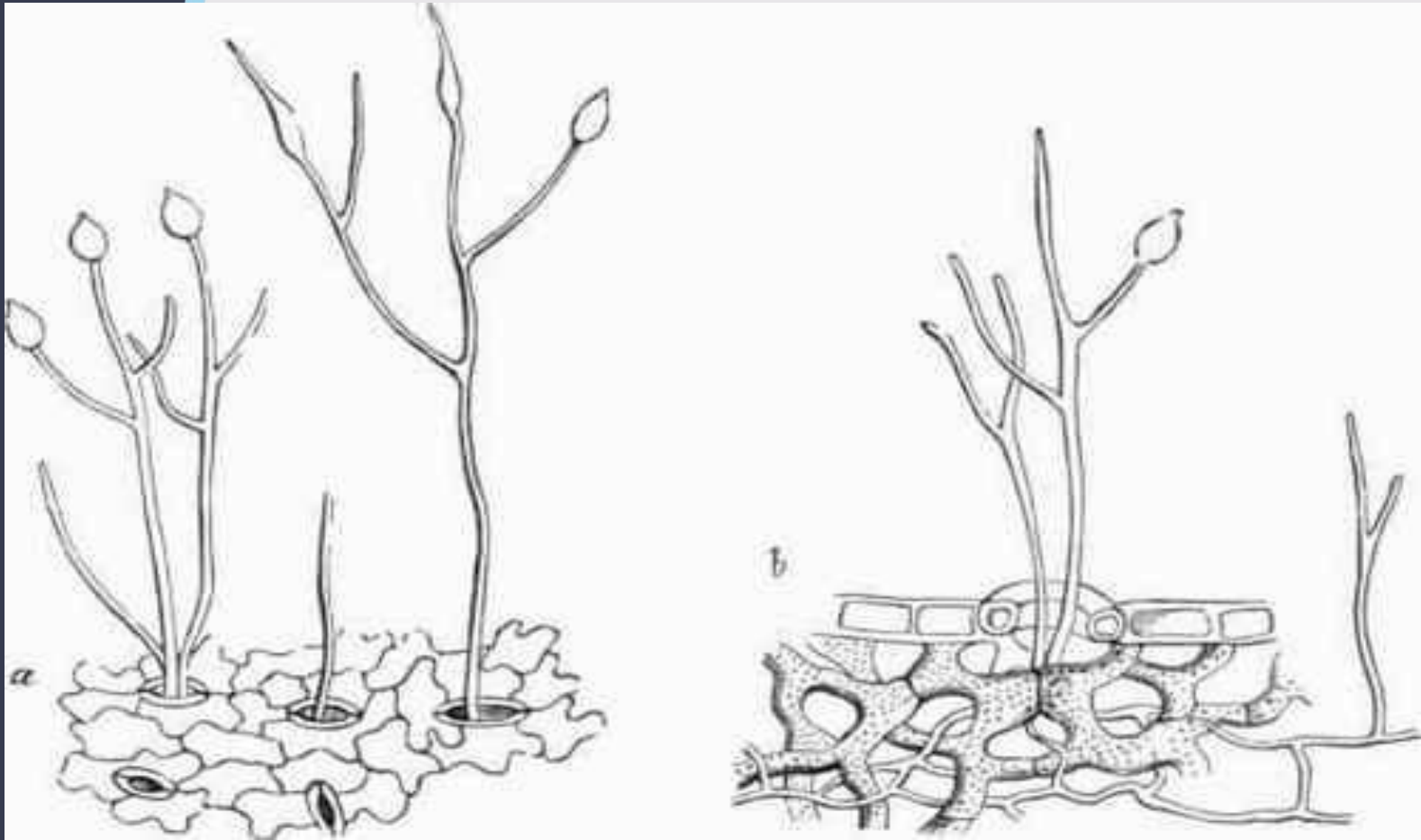




Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

SPORANGIOPHORES AND SPORANGIA





Cont...

FAVOURABLE CONDITIONS

Centurion
UNIVERSITY

Shaping Lives...

Empowering Communities

• Cool moist conditions

- RH: >90% and with suitable temperature (12-13°C) and optimum soil moisture (15-20% saturation).

MANAGEMENT

- Regulatory measures
- Select healthy tubers for planting
- Delayed harvesting
- High ridging to about 10-15cm height reduces tuber infection.
- Grow resistant varieties such as **Kufri Jyothi, Kufri Badshah, Kufri Jeevan, Kufri Sherpa, etc.**
- Resistant sources: *Solanum demissum* and *S. phureja*
- ***Prophylactic measures***
- Metalaxyl (0.1%) or Mancozeb (0.25%) or chlorothalonil (0.2%) or BM (1%) can be applied at 7 to 10 days intervals in the hills and 10 to 15 days intervals in plains.



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

EARLY BLIGHT

SYMPTOMS

- It is prevalent both in hills and plains.
- The disease appears first on old leaves and subsequently spreads to the top young leaves.
- Brown to black necrotic spots angular, oval or circular in shape characterised by concentric rings appear on the affected leaves.
- Unlike late blight, these spots are dry and brittle and smaller in size usually not exceeding 1 cm in diameter.
- Several spots coalesce and affect the entire leaf.
- Sometimes the necrotic tissue drops out leaving shot holes in the leaves.



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

ETIOLOGY

- The pathogen responsible for this disease is *Alternaria solani*.
- Hyphae are light brown or olivaceous which become dark coloured with age.
- The hyphae are branched, septate and inter and intra cellular.
- The conidiophores of the pathogen emerge through stomata from the spots and bear conidia.
- The conidia are long beaked which is often half the long of the whole conidium muriform with 5– 10 transverse septa along with a few longitudinal septa.
- The lower part of the conidium is brown while the neck is colorless.
- Conidia germinate within 35–45 minutes at 28–30°C.



Centurion

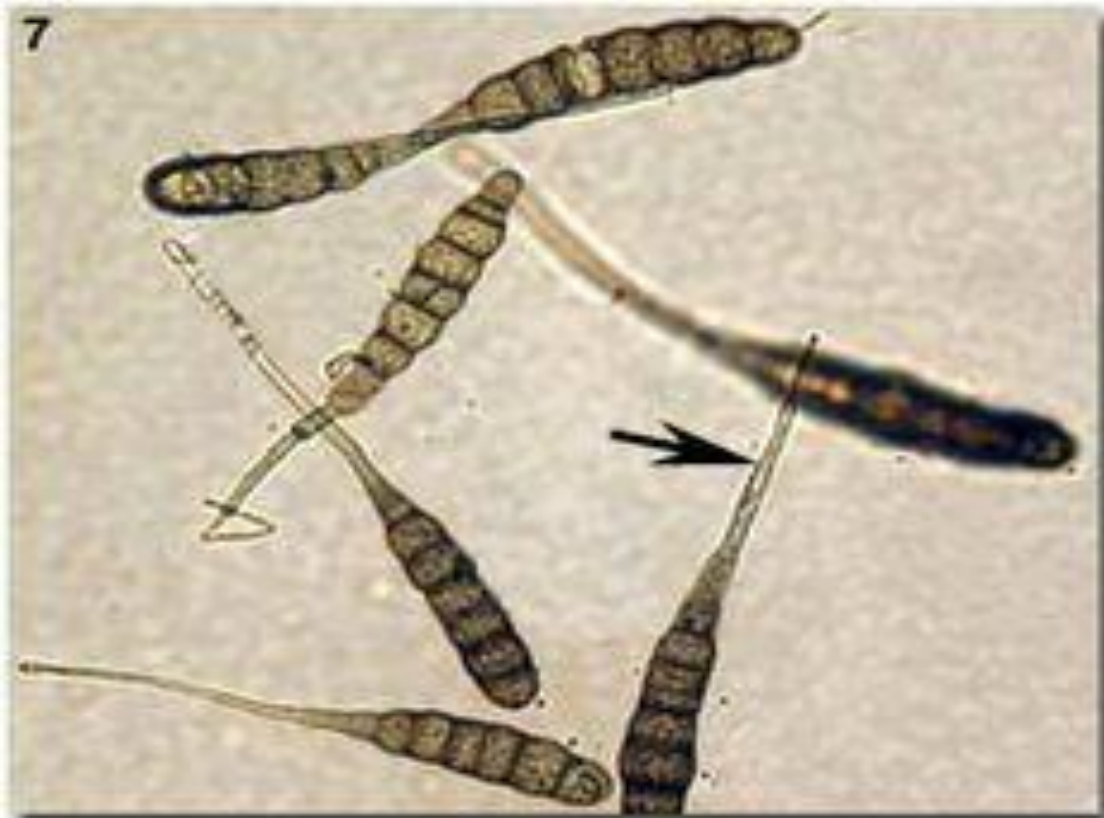
ALTERNARIA LEAF SOFT





Centurion

ALTERNARIA SOLANI CONIDIA





CONT..

FAVOURABLE CONDITIONS

Centurion

UNIVERSITY

Shaping Lives...

Empowering Communities...

- It occurs in high intensities in areas where dry warm weather alternates with the intermittent rains.
- It is serious in late planted crop in Bihar, UP and Punjab.
- Reduction in plant vigour.

MODE OF SURVIVAL AND SPREAD

- The conidia and the mycelium in the soil or in the debris of the affected plants can remain viable for more than 17 months.
- The conidia are disseminated by wind (for long distances), water and insects.



Centurion
UNIVERSITY

Shaping Lives
Empowering Communities

MANAGEMENT

- As the pathogen is soil-borne, crop rotation should be followed for 2–3 years with non-solanaceous crops.
- Disease free seed tubers should be used for planting.
- Dead haulms should also be raked and burnt after harvesting.
- Fungicides like DithaneM-45 @ 0.2%, Blitox-50 @ 0.25%, Captan @ 0.2% etc have also been recommended for disease control.
- Use of resistant varieties is effective. Moderately resistant varieties are Kufri Naveen (for hills), K. Sindhuri and K. Jeevan (for plains). Hybrid 66-528/8 (*Solanum tuberosum* x *S. andigena*) is a source of high resistance to early blight.



Symptom
CENTURY
UNIVERSITY

Shaping Lives...
Empowering Communities

BLACK SCRUF

• Black speck, black speck scab, russet scab on tubers.

- At the time of sprouting dark brown colour appear on the eyes.
- Affected Xylem tissue causes to wilting of plants. Infected tuber contains russeting of the skin.
- Hard dry rot with browning on internal tissue.
- Spongy mass appear on the infected tuber. Seed tubers are source of spread.
- Moderately cool, wet weather and temp 23 °C are the favourable for the development of disease.

Causal Organism - *Rhizoctonia solani*

Sub-division: Deuteromycotina



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Community*

BLACK SCRUF OF POTATO





Disease cycle

- **Primary infection** – Sclerotia present in soil

- **Secondary infection** - Water

Management

- Disease free seed tubers alone should be planted.
- If there is a slight infection of black scurf that can be controlled by treating seed tubers with mercuric chloride solution for 1.5 hr with acidulated mercuric chloride solution for 5 min.
- Treating the soil with pentachloronitrobenzene at the rate of 70 kg/ ha lowers the incidence of the disease, but it is too expensive and cumbersome.
- Well sporulated tubers may be planted shallow to control disease. The disease severity is reduced if the land is left fallow for 2 years.



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Com*

VIRAL DISEASE OF POTATO



Centurion

UNIVERSITY

Shaping Lives...

Empowering Communities...

SEVERE MOSAIC AND MILD MOSAIC

Mild mosaic/Interveinal mosaic – (Potato virus X) PV X

SYMPTOMS

- Often referred as latent potato mosaic
- Light yellow mottling with slight crinkling on potato plants
- Interveinal necrosis of top foliage
- Stunting of diseased plants.

PATHOGEN

Contain ssRNA come under potex virus group.

Virus particle is flexuous, filamentous measuring about $450-540 \times 13$ nm.

SPREAD

- Spreads mechanically through rubbing of leaves, contact of infected plants, seed cutting knives, farm implements.
- Root clubbing of healthy and diseased plants in field

MANAGEMENT



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities*

MILD MOSAIC





SEVERE MOSAIC – POTATO VIRUS Y (PV Y)

Also called **potato leaf drop streak**.

SYMPTOMS

Shaping Lives...
Empowering Communities

- Chlorotic streaks on leaves which become necrotic
 - Necrosis of leaf veins and leaf drop streak
 - Interveinal necrosis and stem/petiole necrosis
 - Plant remain stunted in growth
 - Rugosity and twisting of the leaves occurs in combination with PV X and PV Y

PATHOGEN

- Contain ssRNA come under potyvirus group.
- The particle of virus are elongated, flexuous, helically constructed rod, measuring about $730-740 \times 11-15$ nm.

SURVIVAL AND SPREAD

- Infected tubers
- Spread by aphids, *Myzus persicae* and *Aphis gossypii*

MANAGEMENT

- Disease free seed tubers for planting



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Community*

SEVERE MOSAIC





Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

SYMPTOMS

- Upward rolling of leaves, which have a stiff leathery texture
- Plants stunted and have a stiff upright growth
- Phloem necrosis of tubers in some varieties

PATHOGENS: Potato leaf roll virus(PLRV) ,Family-Luteoviridae and contain ss RNA.

SPREAD

- Infected seed tubers or by **aphids**

MANAGEMENT

- Disease free seed tubers for planting.
- Aphid control.

LEAF ROLL OF POTATO



**PHLOEM
NECROSIS**