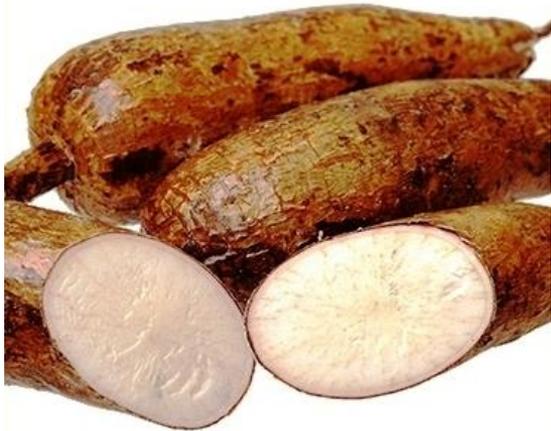


Potato and Cassava



Important Diseases

1. Late blight - *Phytophthora infestans*
2. Early blight - *Alternaria solani*
3. Black scurf - *Rhizoctonia solani*
4. Dry rots - *Fusarium spp.*
5. Wart - *Synchytrium endobioticum*
6. Powdery scab - *Spongospora subterranea*
7. Bacterial wilt - *Pseudomonas solanacearum*
8. Soft rot - *Erwinia carotovora*
9. Common Scab - *Streptomyces scabies*
10. Leaf roll - PLRV-*Myzus persicae*
11. Severe mosaic - PVY
12. Purple top roll - Phytoplasma

1. Late blight - *Phytophthora infestans*

Symptoms:

- Leaves, stems and tubers
- Water soaked spots appear on leaves, turn purple brown & finally black colour
- White growth develops on under surface
- Spreads to petioles, rachis & stem
- Stem breaks at these points and the plant topples
- In tubers, purplish brown spots produced and spread to entire surface
- Tuber show rusty brown necrosis.

1

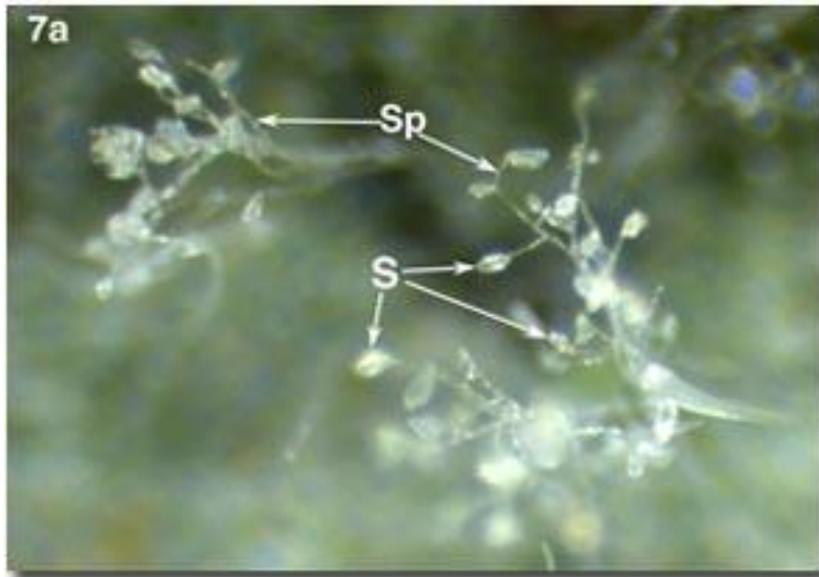






Etiology:

- **Mycelium**- endophytic, coenocytic & inter cellular
- Sporangiohores- hyaline, branched & thick walled.
- **Zoospore**- biflagellate
- **Oospore**- spherical, light brown colour



Epidemiology:

- **RH**- >90%
- **Temperature** - 10-25 °C
- Night temperature: 5-8 °C
- Cloudiness
- **Rainfall** at least 0.1mm

Mode of spread and survival:

Survives in **soils and infected tubers**

Spread by **sporangia** which germinate directly or producing **zoospores** depending on temperature

Management:

- Summer ploughing
- Field sanitation
- Use healthy seed material
- Chemicals – Metalaxyl or Mancozeb –0.2% or Chlorothalonil-0.2%, Bordeaux mixture 1.0%, COC 0.25%
- Resistant varieties: Kufri Red , Jyothi, Naveen, Jeevan
- Avoid mechanical damage during intercultural operations and at harvest
- Good storage facility

Symptoms on tuber



2. Early blight - *A. solani*

Symptoms:

- It occurs in both hills & plains
- **Brown-black necrotic spot** - angular, oval shape characterized by **concentric rings**
- Several spot **coalesce** & spread all over **the leaf**
- Shot **holes**



2



5a



5b



Symptoms on tubers

6a

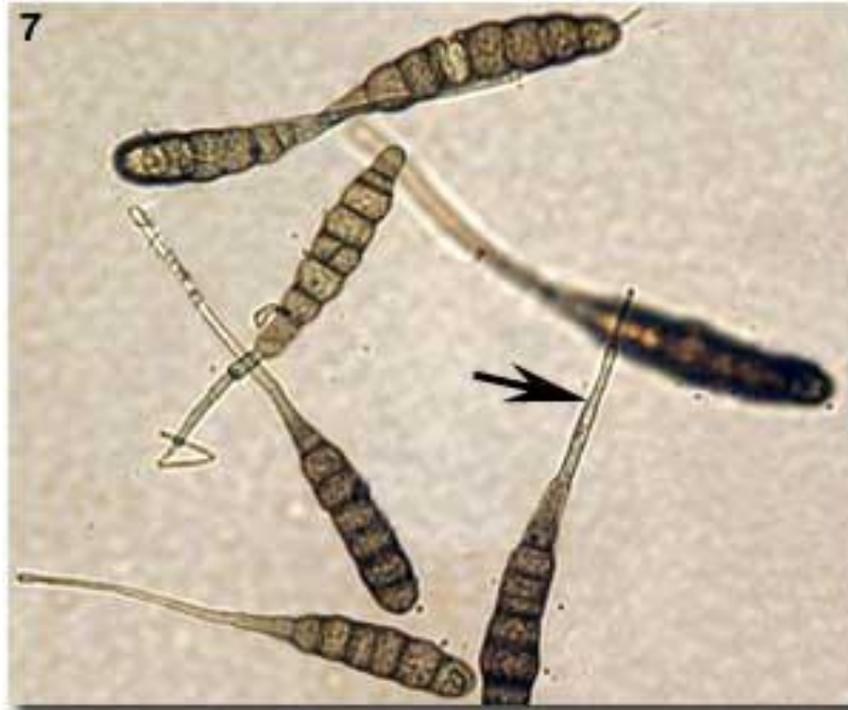


6b



Etiology:

- **Hyphae:** Light brown to dark brown, branched
- **Conidiophore:** Dark brown, septate, erect
- **Conidia:** Club-shape –long beak, light brown colour



Epidemiology:

- Dry warm weather with **intermittent** rain
- **Poor vigour**
- Temperature: **25-30°C**
- Poorly **manured** crop

Mode of spread and survival:

- **Conidia** are wind borne
- Survive on **infected crop** debris
- **Alternate host**: Pepper, Tomato, Brinjal

Management:

- Disease free seed tubers
- Field sanitation
- Recommended doses of fertilizer
- **Fungicide:** Zineb-0.2%, Captan-0.2%, Mancozeb-0.2%
- Resistant variety : K.Sindhuri

3. Dry rot - *Fusarium coeruleum*

Symptom:

- Dark patches appear on inner surface
- Skin is sunken & wrinkled, concentric rings
- Tubers become dry, hard, shrivelled
- Infection takes place through wounds

1

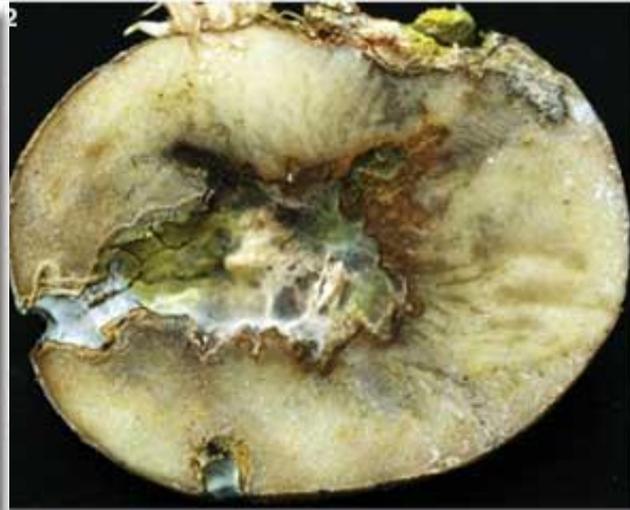


2





Fusarium rot



Etiology:

- **Mycelium:** branched, septate, colourless
- **Conidiophore:** branched, hyaline
- Produces **macroconidia, microconidia, chlamydospores**

Epidemiology:

- High humidity
- **Temperature-15-20°C**

Mode of spread and survival:

- **Contaminated soil**
- The symptoms develop during storage
- Soil borne: **Chlamydospores**
- Air borne: **Conidia**

Management:

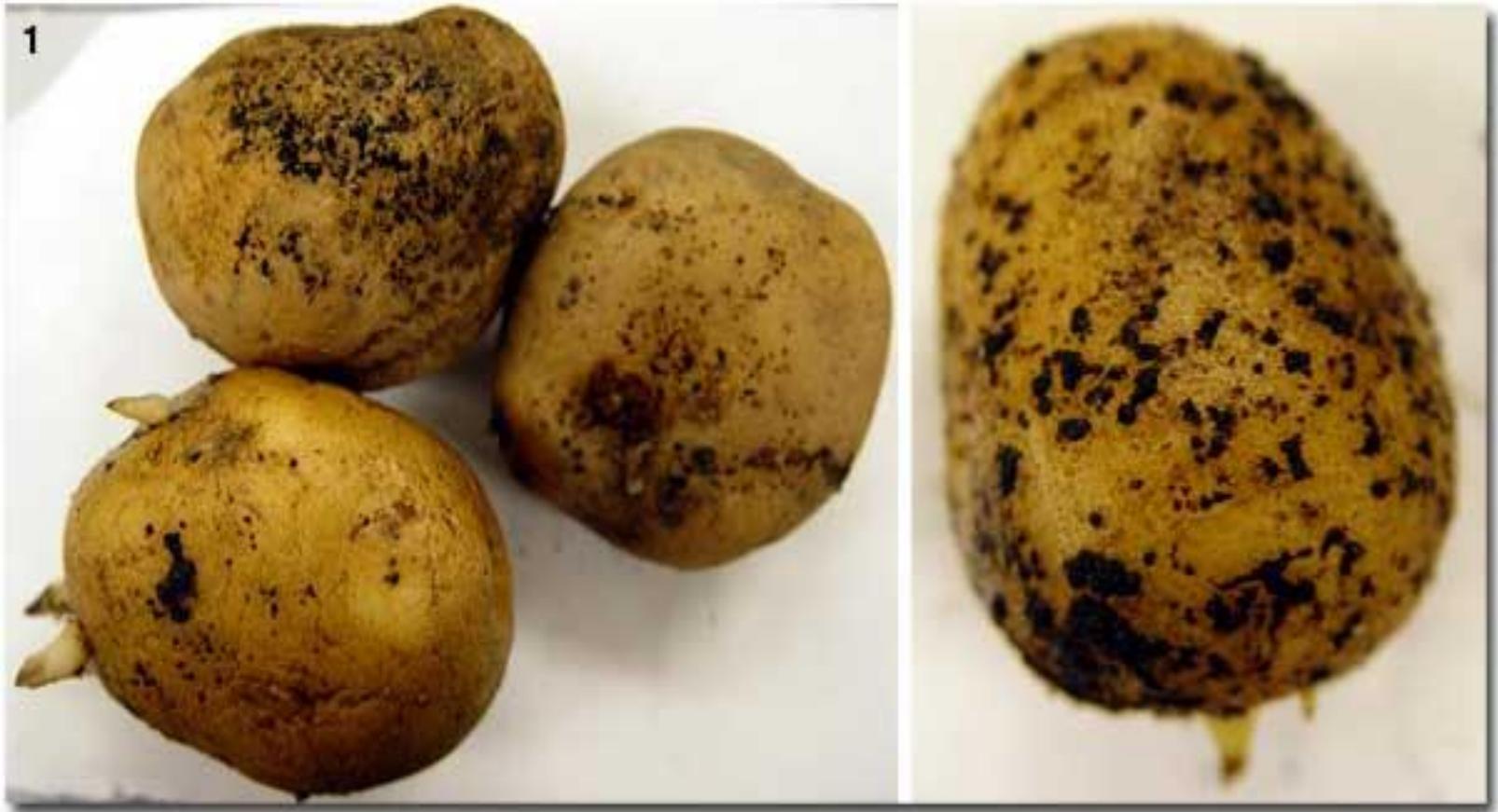
- Avoid injury on tubers
- Field sanitation
- Summer ploughing
- Diseases free seed tubers
- Proper storage
- Dry properly / store in cool place
- Treat the tubers with 0.2% Mancozeb/ Carbendazim
- Box & baskets, storage place spray with 2.0% Copper sulphate'

4. Black scurf / Stem Canker – *R. solani*

Symptoms:

- Sprout injury- sprouts susceptible, dark brown lesion
- Stem canker- reddish brown lesion at soil level, girdle the stem, white fungal growth , black sclerotia
- Wilt

Symptoms on Tubers



Symptoms on Roots



Management:

- Disease free seed tubers
- Long crop rotation / Fallowing
- Use well sprouted tubers
- Red Round, Kufri Red, Kufri Sindhuri, Kuber and Phula are susceptible Kufri
- Tuber treatment with Mercuric chloride / Agallol
- Soil treatment with PCNB

5. Powdery scab

Spongospora subterranea f. sp. *subterranea*

Symptom: Irregular **brown depressions** containing masses of **dusty brown spores** on the surface of tubers.

Outgrowth may develop on the tuber.

Pathogen is **in plasmodial form**.

Produces **zoosporangia**, releases **zoospores**.

Resting spores are formed from the **plasmodium** in spore balls



6. CommonScab

Streptomyces scabies

- Tubers show small reddish or brownish spots, which develop into lesions.
- Lesions may be shallow, corky, pitted or star shaped cracks.
- Severe in alkaline soil.

Management

Tuber treatment with organomercurials.

Soil treatment with PCNB @40kg/ha

Crop rotation with cereals.

Irrigate- to field capacity during tuber formation.



7. Wart – *Synchytrium endobioticum*

Symptoms:

- Gall at the base of the potato stem, or the haulm
- The gall is white when under ground, and black when decaying, may be small or large
- Its surface is rough and corrugated-warty in appearance.



8. Bacterialwilt – *Pseudomonas solanacearum*

Symptoms:

- Wilts at tuber formation
- It may be restricted to one branch
- Stem, petiole of lower leaves & roots become brown; on cutting the infected materials slimy mass of bacteria ooze out
- Browning of vascular region
- The tuber may rot during harvest / storage



Etiology:

- Rod shaped / Gram negative / 1-4 flagella / No spore formation

Epidemiology:

- High temperature & moisture
- Temperature- **25-30°C**
- Moisture- **50%** / pH- **6.2-6.5**
- Crop age increase, diseases incidence increase

Mode of spread and survival:

- Infected soil & tubers
- It invades the plants through injuries in the underground portion of the plants
- The tuber carry the bacterium latently
- Alternate host: Banana, tomato, chillies, brinjal

Management:

- Summer ploughing
- Two year Crop rotation with potato-wheat, cereals
- Diseases free seed tubers
- Field sanitation
- Remove Collateral hosts
- Chemicals : Treat the soil-2.5% Zineb

Formalin-10%, Copper sulphate-0.5%, Streptocycline-
0.5%

9. Leaf Roll Virus - PLRV

Symptoms:

- Upward rolling of margin of leaves.
- Leaves are thick, leathery, brittle sound when disturbed
- Plants are stunted, produce short stem & few tubers clustered around the stem.
- Tubers may develop necrosis.





Mode of spread & survival:

- Grafting
- Vector: Aphids (*Myzus persicae*)

Management:

- Remove the diseased plants
- Healthy seed tubers
- Field sanitation
- Spray systemic insecticide

10. Mosaic - PVX

- Remove the **diseased plants**
- **Healthy seed** tubers
- Field **sanitation**
- Spray **systemic insecticide**



Infected Plant



Healthy Plant

Cassava

Important diseases

1. Brown leaf spot - *Cercospora henningsii*
2. Anthracnose – *Glomerella manihotis*
3. Bacterial blight – *Xanthomonas axonopodis*
pv. manihotis
4. Mosaic - *Indian cassava mosaic virus*

1. Brown leaf spot - *Cercospora henningsii*

Symptoms :

- Leaf spot appear on both sides of the leaf
- Spots are brown with a distinct border
- Later infected leaf turns yellow and dry and eventually drop

Etiology:

- Conidiophores-olivaceous brown
- Conidia - cylindrical straight or slightly curved with both ends
- Conidia – wind borne

Management

- Bordeaux mixture 1 %
- Copper oxychloride 0.25%



2. Anthracnose – *Glomerella manihotis*

SYMPTOMS

- Disease appears as brown circular, elongated or irregular lesions on the leaves
- Severely infected leaves crinkled, dry, wither and fall off

ETIOLOGY

- Conidiophore hyaline and conidia are single with rounded or pointed ends
- Conidia are oblong or oval in shape



Mode of spread and survival:

- Windborne **conidia**
- Infected **debris**

Management:

- Bordeaux mixture 1%
- Copper oxychloride 0.25%

3. Bacterial blight

Xanthomonas axonopodis pv. manihotis

- Leaf spotting and blight, wilting, die back , gum exudation and stem and root- vascular necrosis
- Gram negative, slender rod, motile and non spore forming

Mode of spread:

- Rain splash

Management :

- Disease free cutting
- Use of antibiotics



4. Cassava mosaic - *Indian cassava mosaic virus*

- Chlorotic areas can be seen and leaflets are frequently distorted
- Leaves are reduced in size and misshapened and twisted with bright yellow areas separated by normal green tissues
- Affected plants show stunted growth

✓ Whitefly – *Bemisia tabaci*





Management :

- Diseases free cuttings
- Vector control – Dimethoate 0.03 %
Methyldemeton 0.025%
- Resistant varieties –CE – 9 (1310)
CE – 14
CE – 92 (2171)
CE – 101 (2380)