

PLANT DISEASES

Late Blight of Potato

All potato growing areas of the world

The disease was reported:

- 1830 - 40 - Andies (Europe & USA)
- 1843 - Ireland, England & all Europe
- 1845 - 46 - Irish Famine
- 1870 - 80 - Nilgiri hills
- 1943 – Meerut (UP), India
- **Economic loss - till 65%**

Symptoms

- Disease appear at flowering or any stage
- Water soaked, light yellow / light green spots
- On lower leaves - **brownish black lesion**
- Leaf blighted
- If temp. is favorable - than cover whole leaf &
- Plant in 1-4 days and plant parts rotted



- **If environment is dry-**
- **Tan colour spot appear**
- **In moist season – blue, grey mycelium**
- **Growth – conidiophore**
- **After leaf falling- rotting in tubers**



(1). Wet rot –(i). water secretion

(ii). white growth

(iii). 25 - 45 mm rotting in tuber

(iv). whole potato rot

(2). Dry rot - (i). bluish/black growth

(ii). inner side reddish brown

(iii). 5 -15 mm rotting in tuber

• **Smell from the infected field**

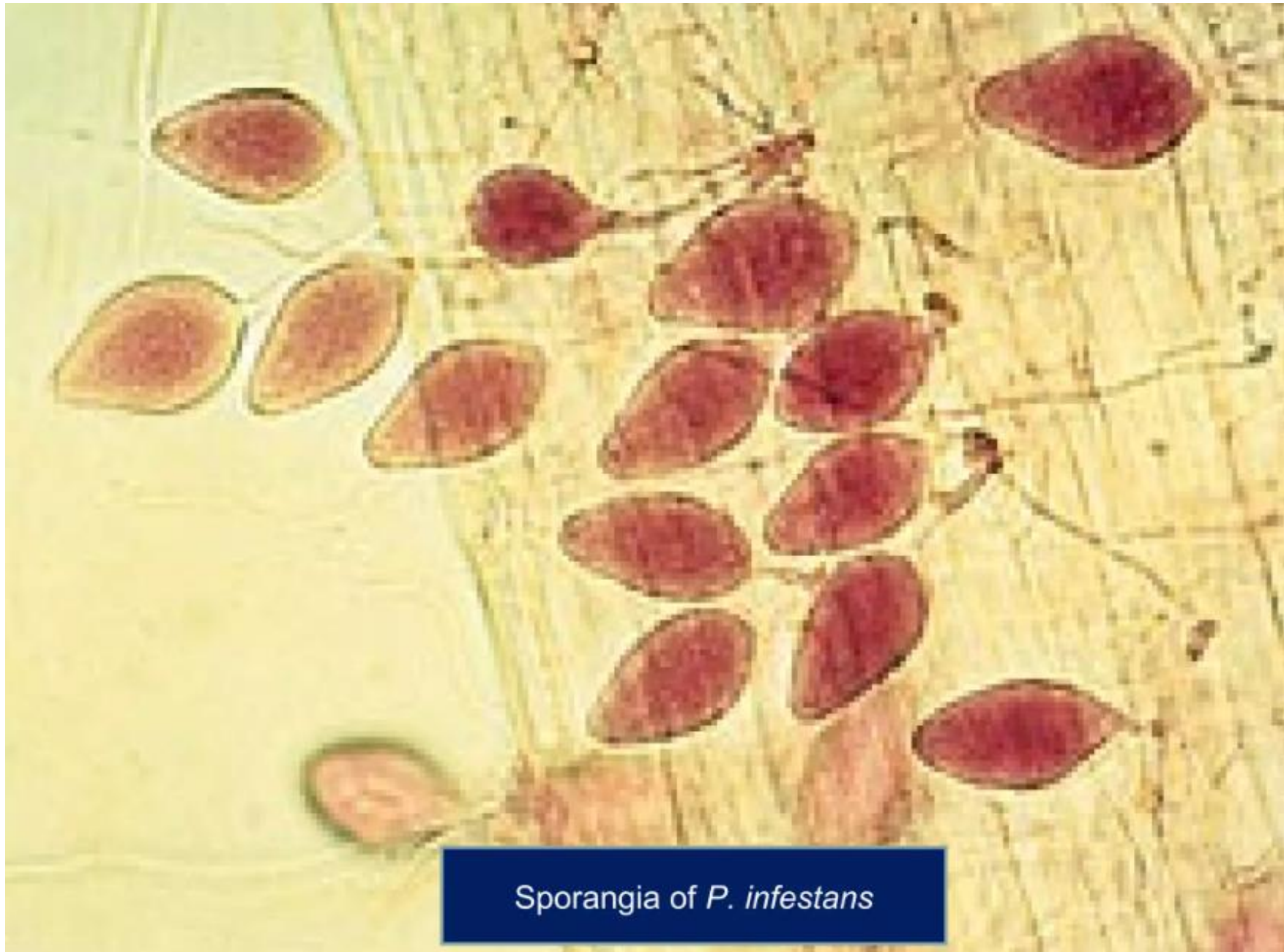


Pathogen – *Phytophthora infestans*

- **Survival** - not in Indian plain due to high tem.
- **Primary source of inoculum** – seed in storage
- **Hills** – plant debris
- **Colletral host** - (i). *Solanum nigrum*
(ii). *Datura*
(iii). *Stramonium* etc.

Systemic Position

Kingdom	–	Mycota/ Fungi
Division	–	Eumycota
Sub division	–	Mastigomycotina
Class	–	Oomycetes
Order	–	Pernosporales
Family	–	Pythiaceae
Genus	–	<i>Phytophthora</i>
Species	-	<i>infestans</i>

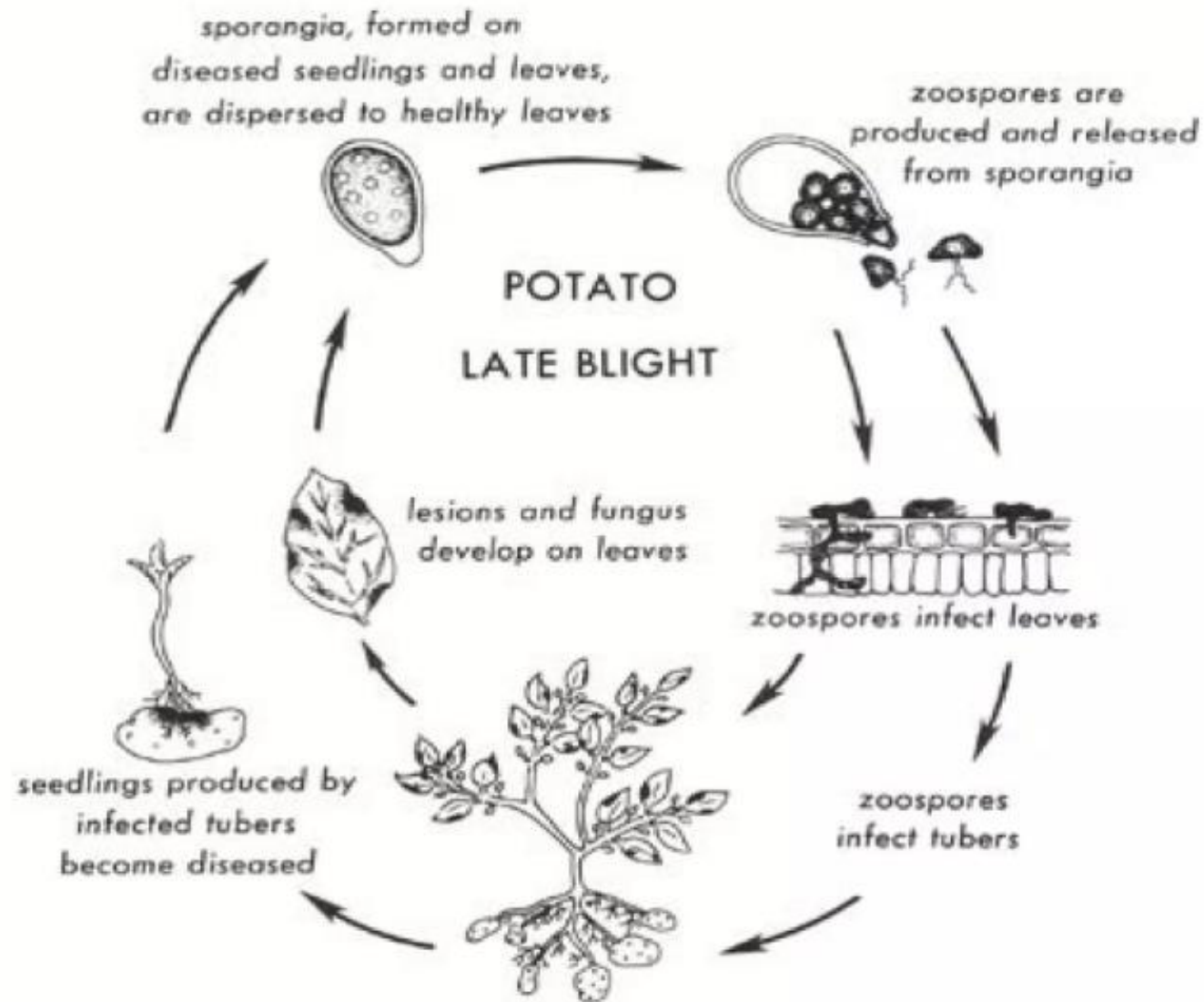


Sporangia of *P. infestans*

Factors responsible for epidemic

- **Night tem. for 4 hrs - below dew point**
- **Minimum tem. - 10° C**
- **Cloudness**
- **Rain for next 24 hrs - at least 0.1mm**

Life cycle



Disease Management

- 1. Use of healthy seed**
- 2. Removal of plant debris (field sanitation)**
- 3. Removal of weeds**
- 4. Harvesting in dry season**
- 5. Harvesting after ripening**
- 6. Remove upper portion before 15 days of harvesting**
- 7. Earthing- 10-15 cm**

8. Balanced fertilization of N₂ & proper irrigation

9. Seed treatment- Ridomil 5% dust -1kg/100 kg seed

10. Storage at 3.5 – 4.4° C

11. Spray- Mencozeb, Dithane Z- 78 - 2.5 kg/ha, 4-6 sprays – 14 days interval or Captafol 8% WP- 2.5 kg/ha, or Metalaxyl 280 gm A.I. + Mencozeb 1.8, 75 %WP (2.5 Kg/ha) – 10-15 days interval

12. Use resistant varieties – Kuphri Badhsaha, K. Alankar, K. Swarna, K. Jeevan, K. Jyoti etc.

Early Blight of Potato

- Disease is world wide
- In India – Assam, Tripura, , West Bengal, Bihar, UP, UK, Haryana, Punjab, HP etc.
- More in hilly area
- Loss- till 20-50%

Symptoms

- **Appear before late blight after 4-5 weeks of sowing**
- **Lower leaf first affected & scattered spots**
- **Covered with greenish blue growth of fungus**
- **Later spots – brown & concentric rings**



- **Chlorosis due to alternaric acid**
- **Leaf falling**
- **Black to brown spots on stem**
- **Branches or plant die**
- **Rotting in tubers**
- **Tubers less & small**
- **Starch lacking in tuber**



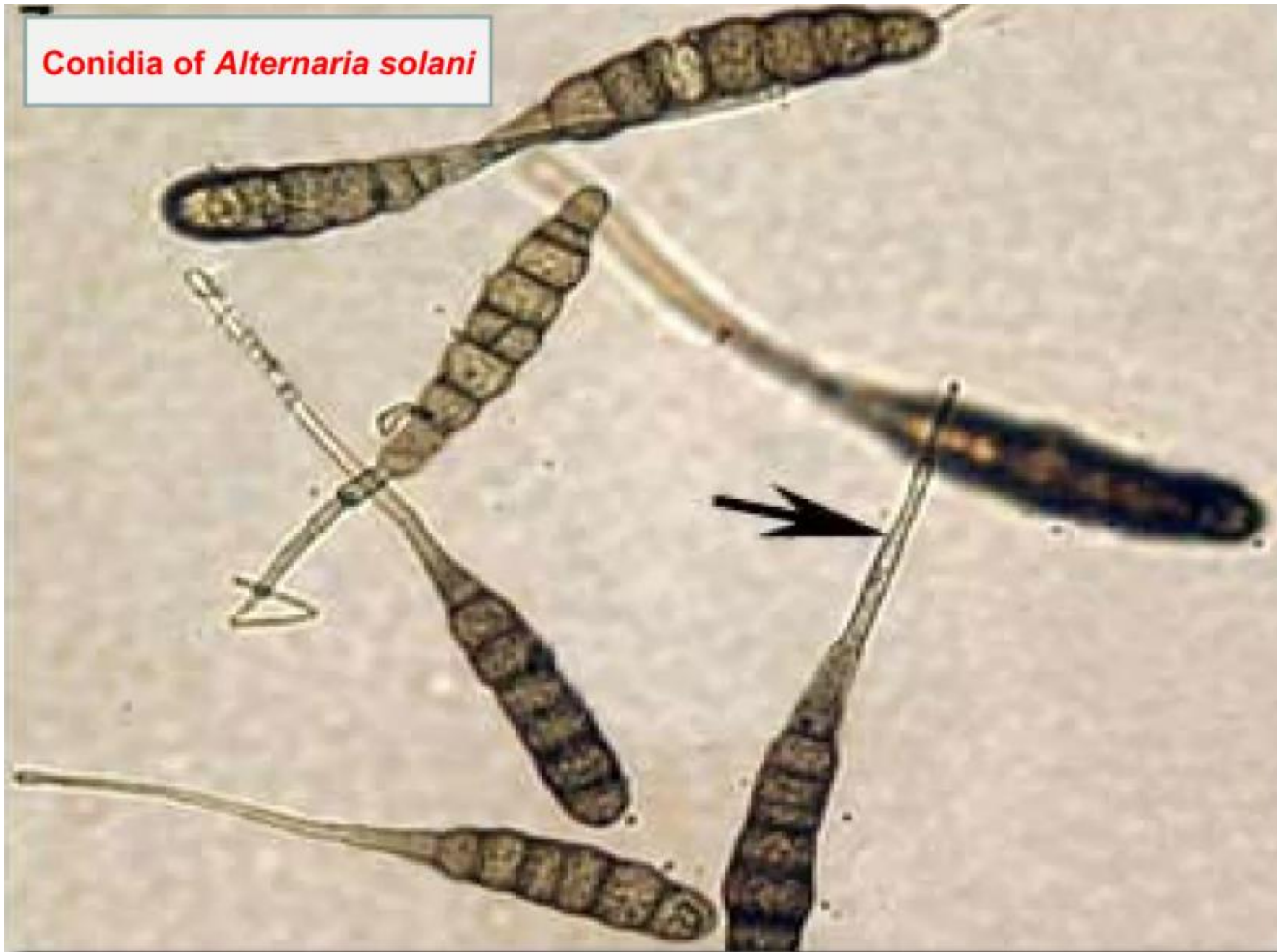
Pathogen – *Alternaria solani*

- Weak pls. more susceptible
- Disease is soil & seed borne
- Pathogen survive as conidia & mycelium in seed & plant residues
- Collateral host – tomato etc.
- Fav. - Tem. - 28 - 30° C for conidia germination
- R. H. – high

Systemic Position

Kingdom	–	Mycota/ Fungi
Division	–	Eumycota
Sub division	–	Deuteromycotina
Class	–	Hypomycetes
Order	–	Hypomycetales
Family	–	Dematiaceae
Genus	–	<i>Alternaria</i>
Species	-	<i>solani</i>

Conidia of *Alternaria solani*



Disease Management

- Removal of pl. residues
- Crop rotation – 2 yrs.
- Spray – Zineb (Dithane M- 45) @ 0.25% or Kavach 75

WP @ 0.2% at 10 – 15 days interval

- Dis. Res. Var.- Kuphri Alankar, Kuphari Naveen, K.

Jeevan, K. Sinduri

BLACK/STEM RUST OF WHEAT

Life Cycle of *Puccinia* (Summary)

Stage 1 in Wheat: Aecidiospores germinates on wheat; later dikaryotic hyphae form Uredia bearing uredospores.

Stage 2 in Wheat: Seasonal change triggers the formation of telia or teleutosorus bearing teleutospores in the place of uredosorus.

Stage 3 in Wheat: Teleutospores produce promycelia bearing basidiospores on basidium.

Stage 4 in Barberry: Basidiospores germinate forming extensive hyphae with Spermogonia or Pycnia bearing spermatia and receptive hyphae (pycnidial stage). Later, nuclei of opposite strain remain in common protoplasm without fusion forming dikaryon.

Stage 5 in Barberry: Aecidia bearing aecidiospores produced in lower leaf surface of Barberry infects wheat again.

Different spore stages

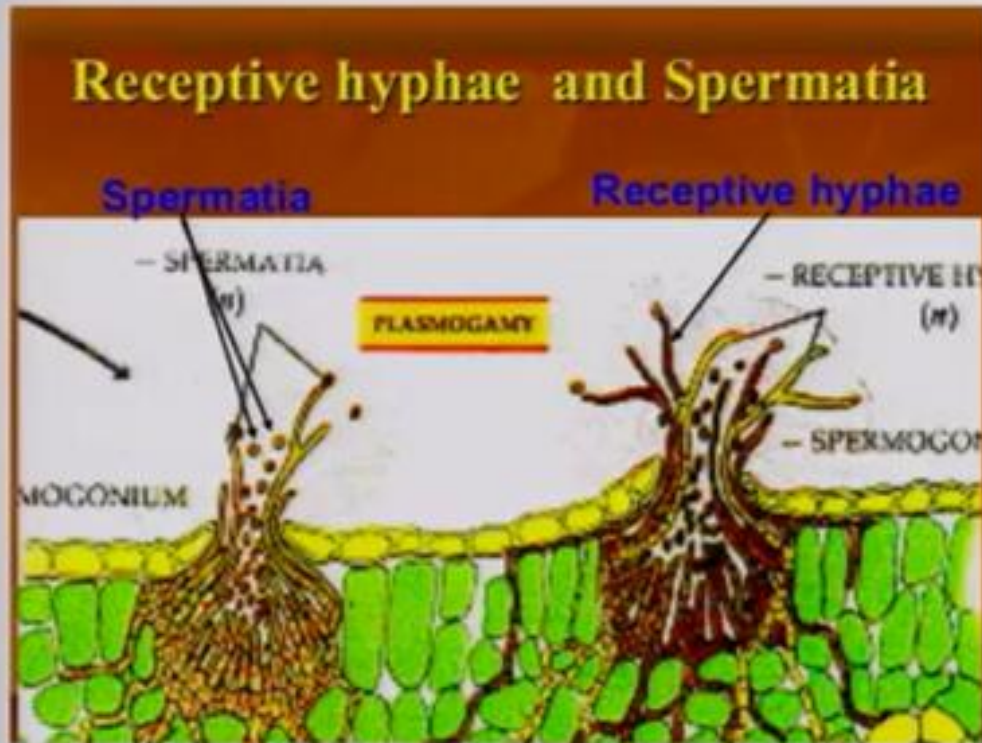
Stage	Spore	Nucleus status
0	Spermagonia with spermatia (pycnia with pycniospores)	Uninucleate
I	Aecia with aeciospores	Binucleate
II	Uredia with uredospores	Binucleate
III	Telia with teleospores	Binucleate
IV	Basidia with basidiospores	Uninucleate

Barberry



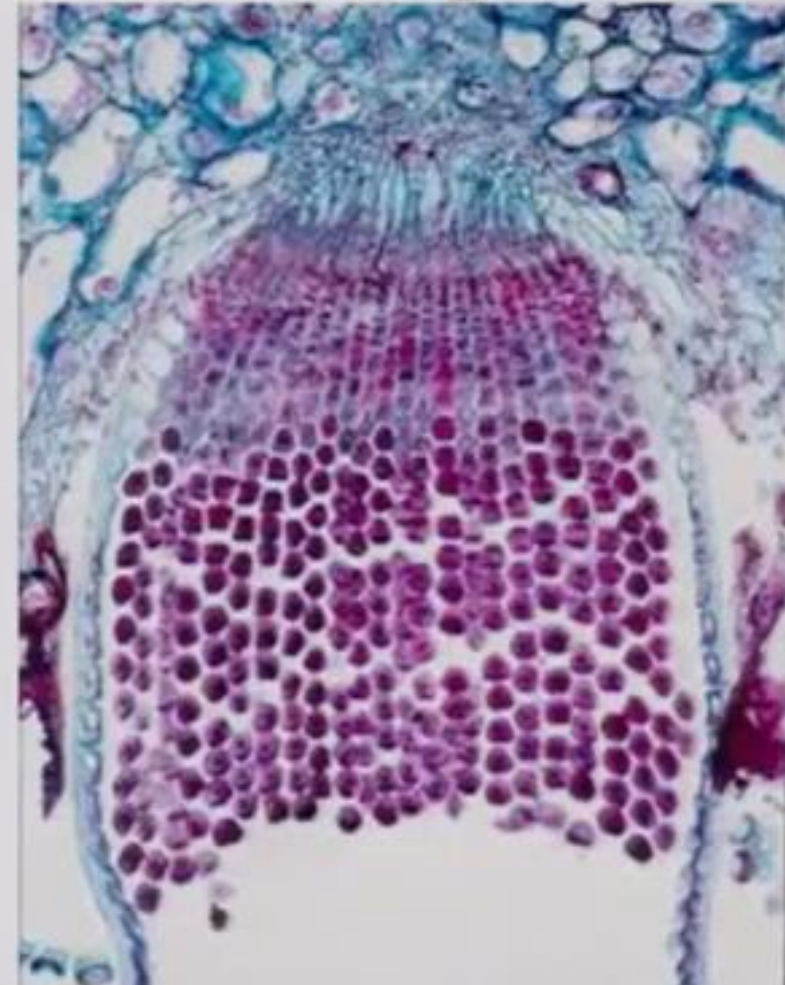
P. graminis tritici

Spermogonium



ON Barberry

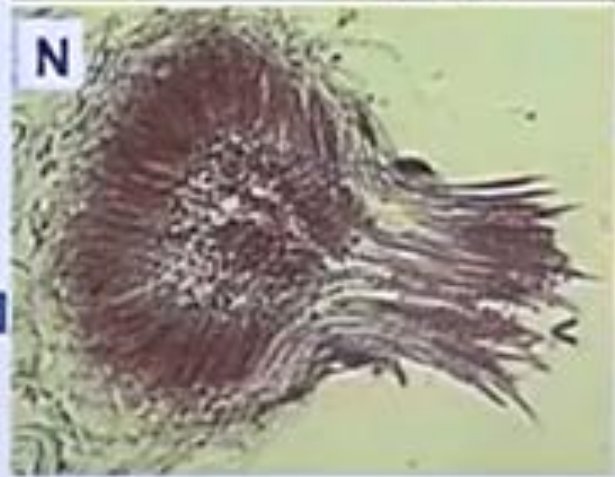
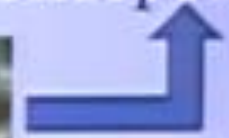
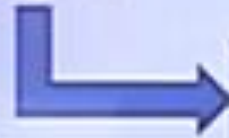
Aecial cup with Aaeciospores



Barberry

Lesions with Spermogonia at center

Pustules of aeciospores



Section of a spermogonium

Cross section of aeciospores

On wheat



P. graminis tritici ON WHEAT

Urediospores



Teliospores



Germination of teliospore

Germination of teliospore

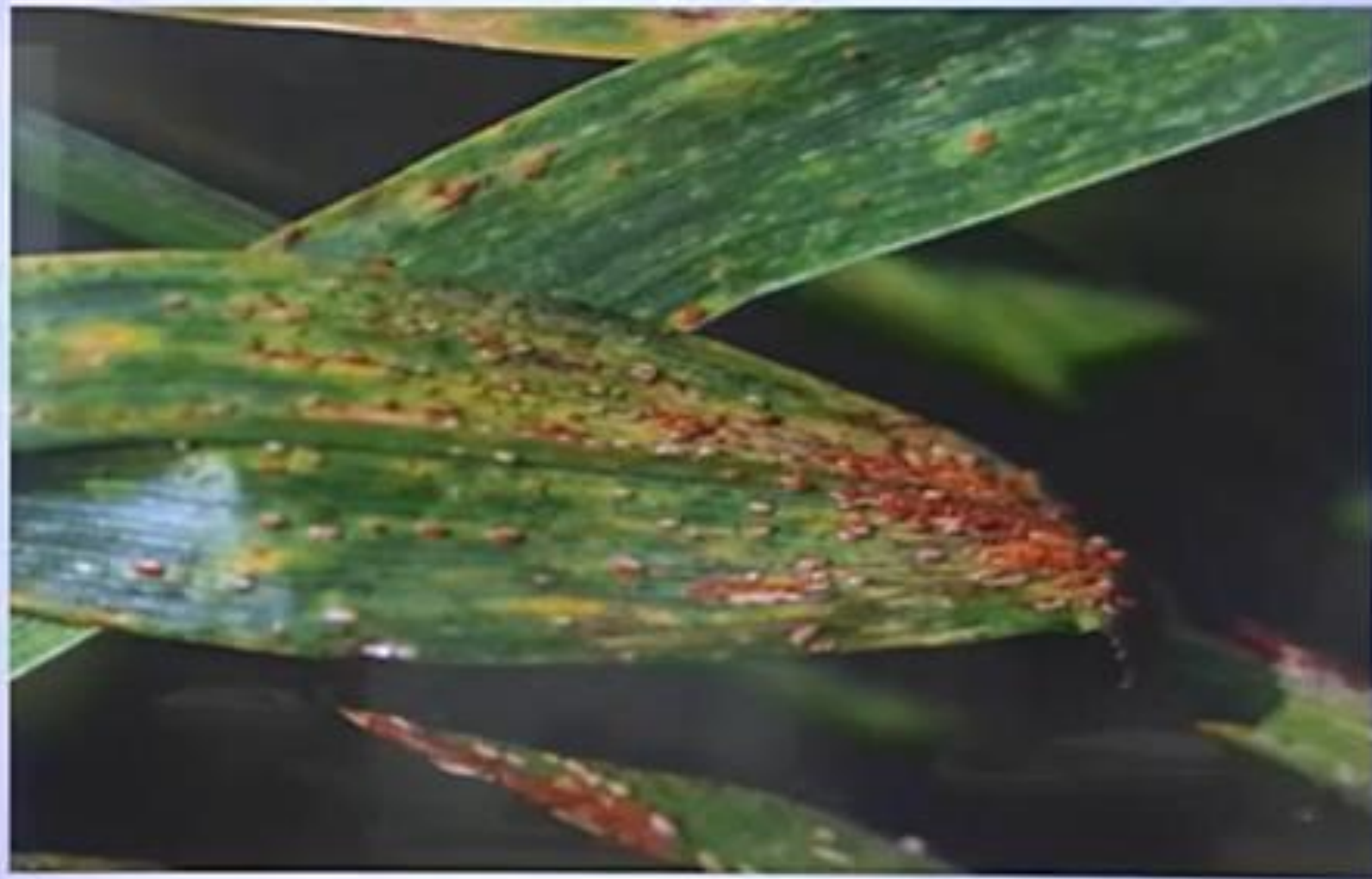


Promycellium with basidiospores



Black /Stem rust – *P.graminis tritici*

Leaf symptom



To manage rust of wheat, you can take the following steps:

- Sow rust-resistant varieties of wheat.
- Use only treated seeds for sowing. If farmers want to sow the seeds available with them, then sow the seeds after treatment.
- Sow the crop on time.
- Do not irrigate more than required and use only the proper amount of nitrogen.
- Dust with sulphur @ 6.7 to 9.0 kg per acre or spray with zinc sulphate or parate @ 2.25 litres + 336 grams per 450 litres water per acre.
- Avoid susceptible varieties of wheat.
- Heavy grazing or the use of herbicides during autumn to remove self-sown susceptible wheat will reduce the amount of rust in following crops.
- Use seed treatments and foliar fungicides.



THANK YOU