



Early and Late Blight of Potato

[For B.Sc. III year (paper III unit IV) and B.Sc. Ist Sem.(unit VII)]

Dr.Sanjay Srivastava
Botany Department
H.C.P.G.College
Varanasi

EARLY BLIGHT OF POTATO

- The name of the disease is because of the infection on potato crop taking place in earlier part of growing season.
- The disease is worldwide in distribution.
- In India, when the disease is severe it may lead to almost 40% loss of yield in potato crops.
- Besides potato other members of family Solanaceae such as tomato, cabbage, Chili, brinjal, cauliflower etc. and a number of wild species of plants act as Collateral hosts for the fungal pathogen.

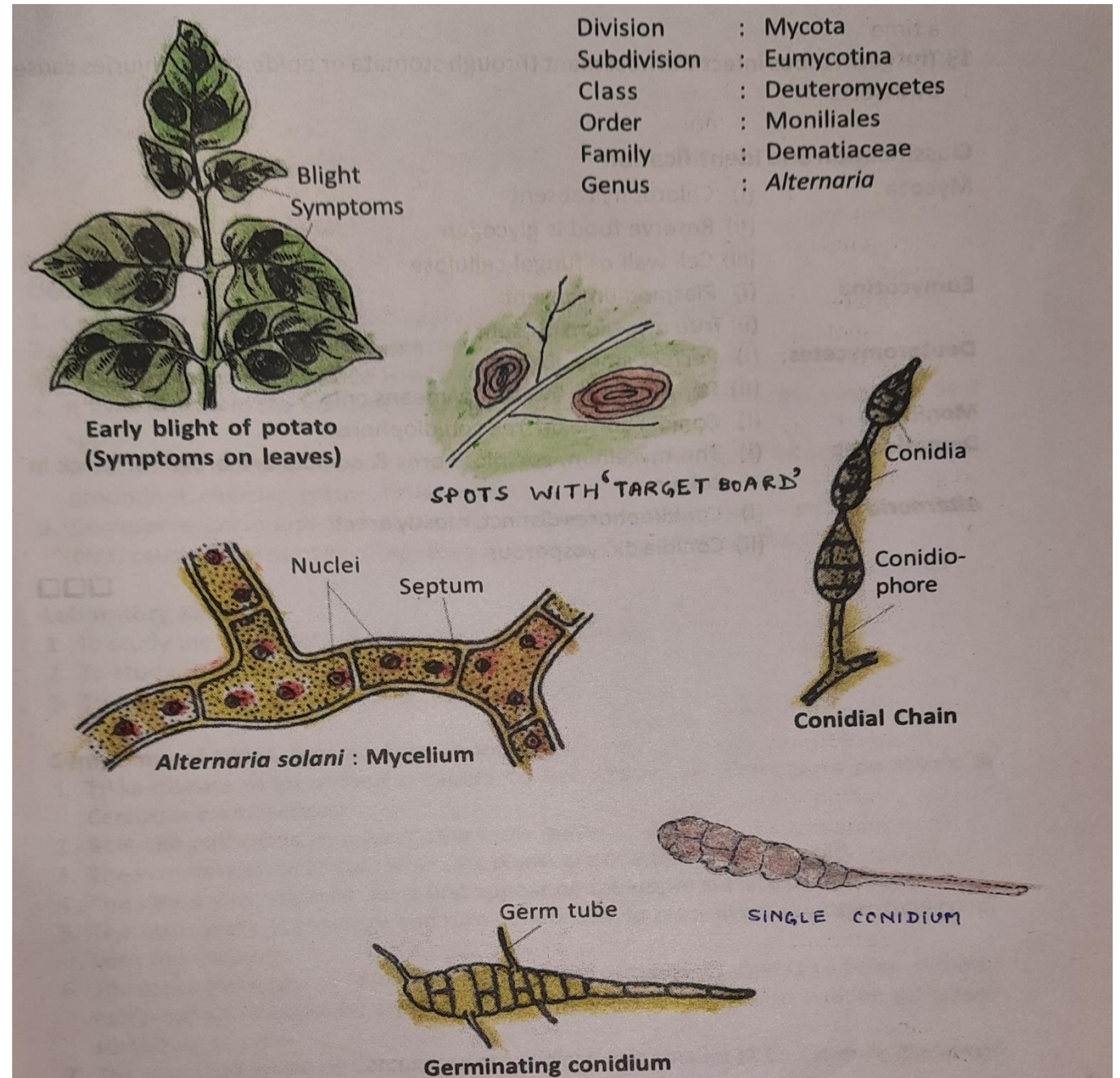
SYMPTOMS

- Being an early infecting pathogen, the symptoms of the disease start appearing when the plant is 3 weeks old.
- The leaves which are near the ground first show small circular or irregular dark brown to black spots.
- The peculiar characteristic of these spots is the presence of concentric rings which give it a target board like appearance.
- These spots later enlarge in size and adjacent spots coalesce to form large angular spots.
- The symptoms later also develop on the petiole and stem in the form of elongated brown to black lesions.
- In the advanced stage of growing season numerous lesions appear on the upper leaves.
- The leaves drop - a case of premature leaf senescence.
- Tubers also show symptoms in form of dark and sunken lesions on the surface which are circular or irregular in shape. If cut open, the tubers show dry corky texture with dark brown colour inside.

➤ **CAUSAL ORGANISM:**

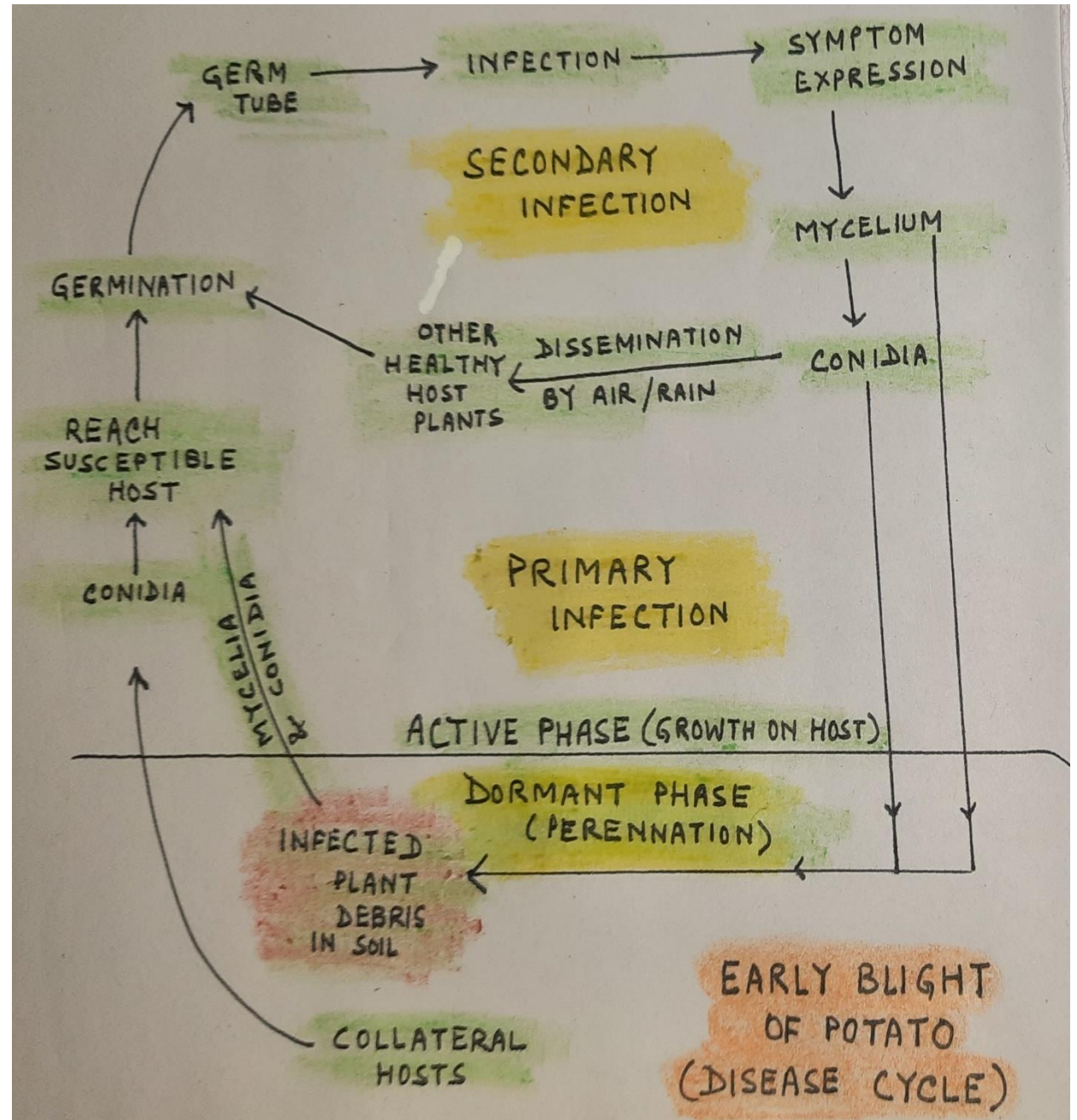
Alternaria Solani

- Mycelium of the fungus is branched, septate and grows both inter and intracellularly through the host tissue.
- Haustoria are absent.
- Each cell of the hypha is usually multinucleate.
- At maturity the mycelium produces conidiophores.
- Conidiophores emerge through stomata or dead epidermal cells.
- Conidiophores are short, dark coloured, aerial, septate and little curved at the tip.
- Conidia are produced at the tip of conidiophores either singly or in chain.
- Each conidium is beaked, bottle shaped, obclavate (club shaped), muriform (having horizontal and vertical septa - dictyospore).



DISEASE CYCLE

- The fungus survives on the plant debris left in the field on decaying potato tubers or on some collateral host such as tomato or some wild species of family Solanaceae.
- The **primary inoculum** which is usually in the form of a mycelium or a spore, disseminates through the agency of wind or rain splash or irrigation water and reaches the host leaf surface where it germinates and brings about **primary infection**.
- After the fungus establishes itself inside the host tissue the stage of **secondary infection** starts.
- In this stage, the pathogen produces conidia on the surface of the leaves.
- Conidia are produced in large numbers.
- They are disseminated by wind, splashes of rainwater or irrigation water and reach other healthy potato plants where they cause secondary infection.



CONTROL MEASURES:

Proper fertilization, irrigation and management of pests through various means.

Cultural Practices:

- Crop rotation
- Field sanitation
- Growing late sowing varieties
- Diseased plant parts should be destroyed completely by burning.

Chemical Pesticides:

- Fungicides should be use in justified manner and only when symptoms appear.
- Example of fungicides : Copper fungicides such as **maneb**, **mancozeb**, **Zineb (Dithane Z-78)**, **Blitox-50 (.25%)**, **Captan**, **Bordeaux mixture** etc.

Biocontrol:

Fungal species *Trichoderma harzianum* and *T. viride* are used as bio fungicide.

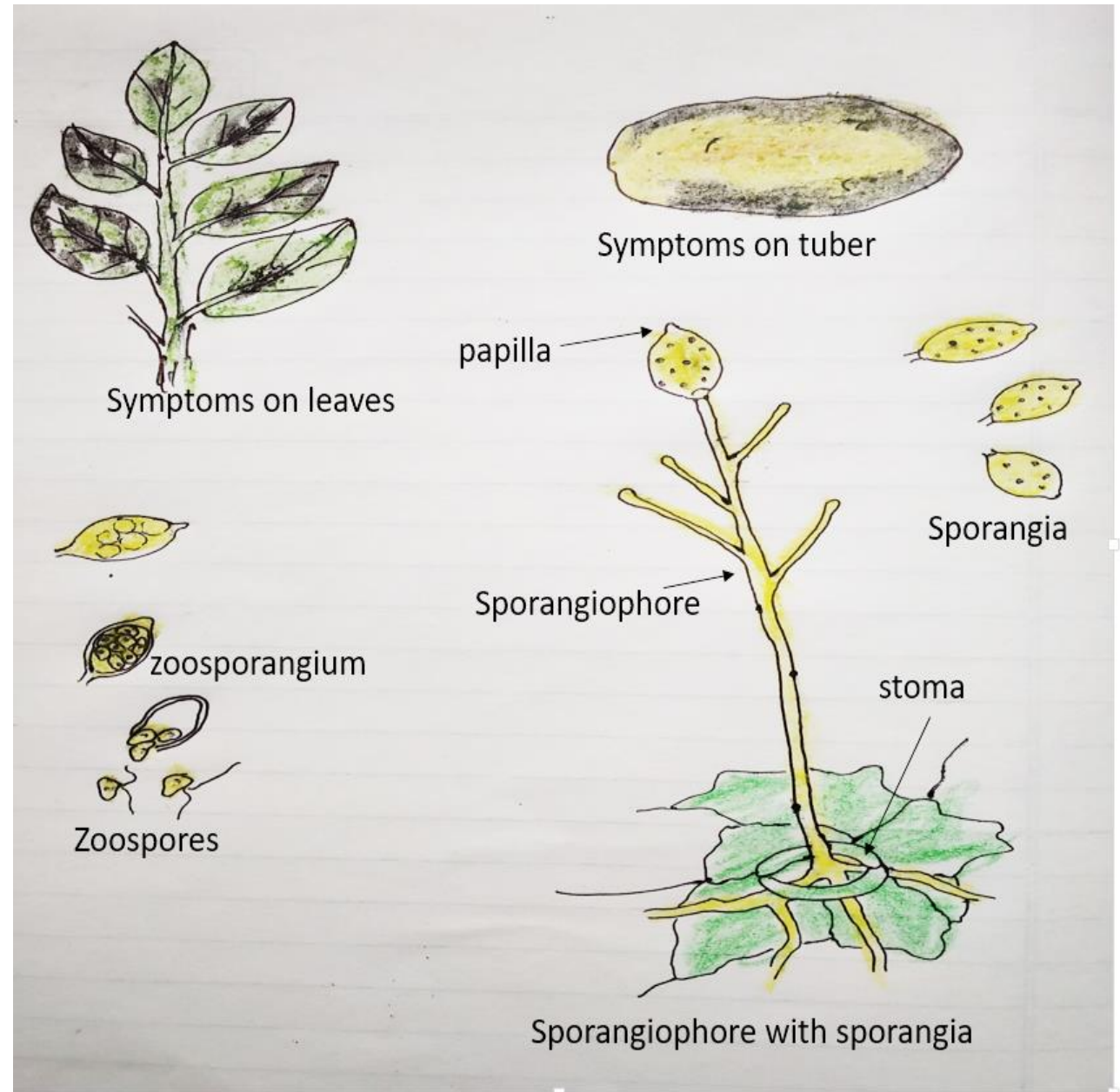
LATE BLIGHT OF POTATO

- A very serious and important disease of potato which can result in total destruction of potato crop in a short period of time.
- Losses due to this disease can reach up to 80% in years of epidemic.
- It was the cause of the infamous **Irish Famine** which occurred during 1843-45. About a million people lost their lives and an equal number migrated to USA and other countries due to the epiphytotic disease.
- In India it was first recorded in 1870-80 in Nilgiri hills. Now occurs in many states such as U.P. Punjab, W.B., Karnataka, Uttarakhand etc.

SYMPTOMS:

- Late blight of potato appears in the fields only after blossoming period.
- Above ground parts of the plant body are infected initially but later on the infection spreads in the tubers also.
- Symptoms appear first on the surface of leaves in the form of dark brown or black coloured small patches.
- Under favourable Seasons the spots gradually increase and occupy almost entire surface of the leaf.
- The sporangia are formed on the lower side of the leaf as powdery mass surrounded by a distinct border thus producing blight.

- The blight represents the rapid death of the cells which later on get transformed into dark brown to black lesions giving burnt appearance.
- Under severe conditions these spots also appear on stems.
- Under warm and humid conditions the spots change their colour and stems also get infected.
- The infected Tuber gives the smell of decaying vegetable matters.
- It is remarkable feature of this disease.
- The skin of tubers become soft sunken and dark in colour.



CAUSAL ORGANISM : *Phytophthora infestans*

DivisionMycota

Sub-divisionEumycota

Class.....Oomycetes

Order.....Peronosporales

Family.....Pythiaceae

Genus..... *Phytophthora*

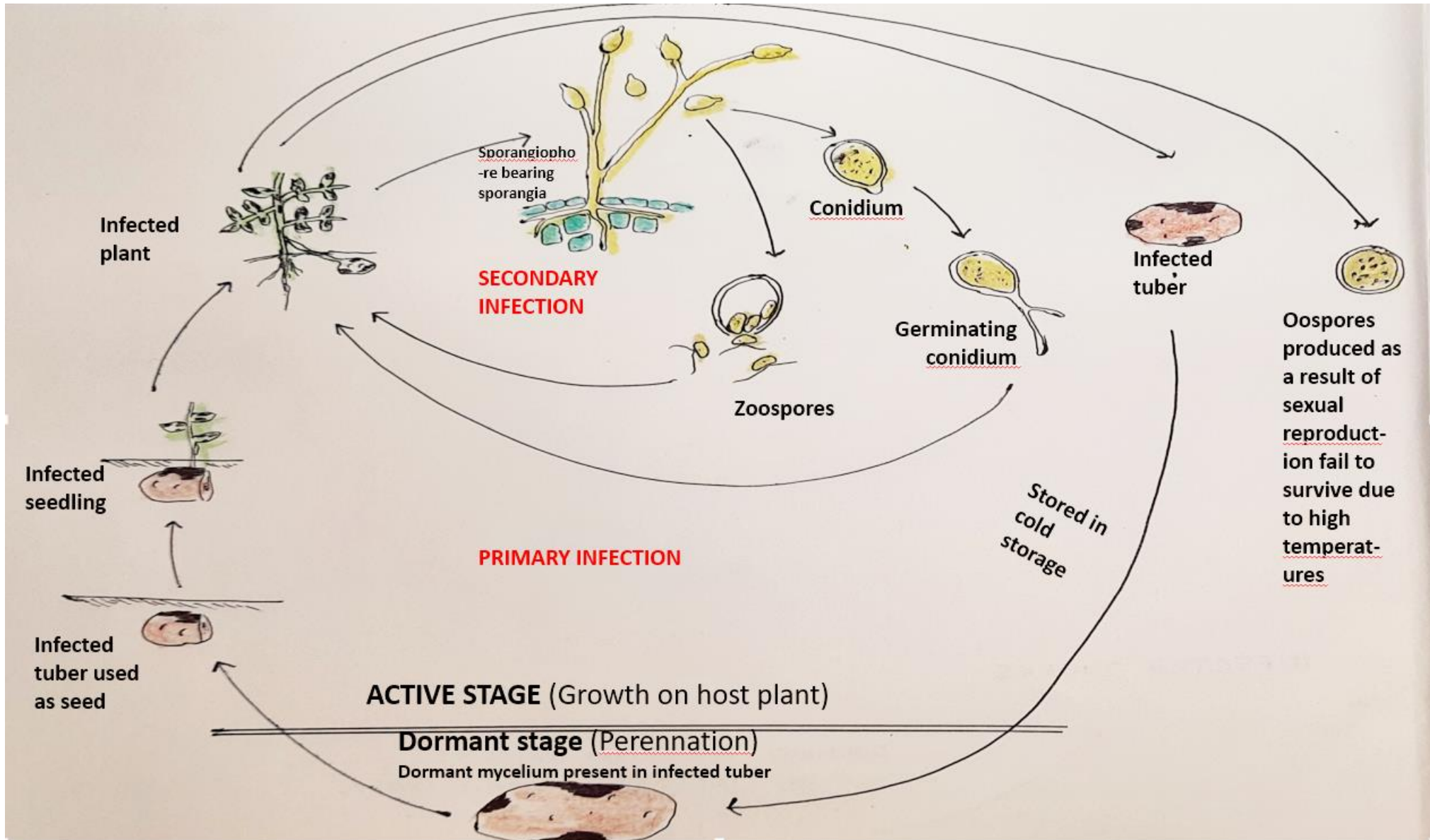
Species..... *Infestans*

- Mycelium is tubular, hyaline, irregularly branched, aseptate and coenocytic.
- Hyphae may be intracellular or intercellular.
- The intercellular hyphae develop globular, finger or club-shaped haustoria inside the neighbouring host cells.
- The cell wall lacks chitin and is mainly composed of glucan.
- The Protoplasm contains numerous nuclei, vacuoles and oil globules used as reserve food.
- Asexual reproduction takes place by conidia or sporangia developed on branched conidiophore or sporangiophore.
- Sporangia are formed at an optimum temperature ranging between 18 and 22°C.
- The sporangiophore show swelling at the place of attachment of sporangia.
- Two phases of germination of sporangia occurs based on the prevailing temperature.
- **When the temperature is above 15° C , the sporangia behave like conidia and directly germinate forming a germ tube (DIRECT GERMINATION).**
- **If the temperature is lower than 15° C (around 9° C) with 100% relative humidity , then the sporangium produces 3 to 8 biflagellate zoospores. These zoospores settle, encyst and then germinate producing germ tube (INDIRECT GERMINATION)**

DISEASE CYCLE:

- Infected tubers are the primary source of inoculum in India.
- The use of cold storage for storing potatoes and the fast means of transportation of seed materials from hilly regions to plains has led to rapid spread of disease.
- Crop residue is the source of **primary infection** in hilly areas. This is not possible in plains due to the high temperatures.
- When infected tubers (in which fungal mycelium is present) is used as seed material and is sown, the plant which arises gets infected.
- The fungal mycelium grows systemically with the growing seedling.
- Lower leaves first show symptoms.
- **Secondary infection** takes place from spores produced on primary infected parts.
- Spores in form of **zoospores (INDIRECT GERMINATION)** or **sporangia behaving as conidia (DIRECT GERMINATION)** serve as secondary inoculum.
- Secondary inoculum reaches healthy plants through the agency of wind, rain, irrigation water or insects.

Disease cycle:



CONTROL MEASURES:

- Only healthy tubers should be selected and used as seed material.
- Before sowing the tubers should be immersed in 1: 1000 mercuric chloride solution for 90 minutes.
- Bordeaux mixture (copper sulphate: lime : water = 4:4:50) is most effective fungicide to control the disease.
- Dithiocarbamates such as zineb, maneb etc. are now widely used to control the disease.
- Other chemical fungicides used are : copper-lime dust, zinc sulphate etc.
- Growing resistant varieties of potato such as kufri alankar, kufri moti, kufri badshah, kufri swarna, JH 232, F 5242 etc. is another means of avoiding the disease.