

B.Sc. Third Year, Semester - V
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Plant Pathology Unit-2

3) Plant Diseases of Vegetables

a) Late Blight of Potato



Dr S. S. Patale

Associate Professor
Department of Botany

Smt. S. K. Gandhi Arts, Amolak Science
and P.H. Gandhi Commerce, Kada Dist. Beed

Email- sspatale@rediffmail.com Ph. 9823937501



a) Late Blight of Potato

Causal Organism: *Phytophthora infestans*

Host: *Solanum tuberosum* (Potato)

- **Classification**

- **Division-** Mycota
- **Sub Division-** Eumycotina
- **Class-** Omycetes
- **Order-** Peronosporales
- **Family-** Pythiaceae
- **Genus-** *Phytophthora*
- **Species-** *infestans*

Distribution

- **Late blight is a serious fungal disease worldwide in distribution. It is destructive to crop grown in the rainy season. The disease occurs annually in cooler Himalayan regions extending from Assam to Kashmir at an altitude of 6000 ft or more. The temperature below 23°C is favourable for the appearance of the disease. Now it has established itself in the Indo-Gangetic plain and occurs annually in the states of Punjab, U.P., Bihar and West Bengal.**
- **The damage caused by the disease is frequently very high. Severe damage to foliage shortens the growing season. Consequently the tubers remain small and reduced in weight. They are produced in smaller numbers. In severe cases of infection there is complete loss of the crop. Infection also results in the decay of tubers in the field and storage.**

Symptoms:

The disease first appears on the tops of the plants generally after blossoming period but mostly in the month of January. It may appear at any time during the growth period of the plant. The disease appears as small, dead, and brownish to purplish black areas or lesions. These appear on the tips and margins of the leaflets, rachis, petiole and stem. Under favourable conditions, the lesions rapidly increase in size involving the whole surface of the leaf. The blighted leaves curl and shrivel in dry weather. Under moist condition they decay and emit a characteristic offensive odour. Potato tubers are often infected in the field after the tops have been blighted. There is brownish discolouration of the skin of those parts of the tubers which lie nearest the surface of soil. In cool and dry conditions the progress of the disease is slower.



Potato Products



Late Blight of Potato

Causal organism and disease cycle:

The causal organism is *Phytophthora infestans*. The mycelium is aseptate coenocytic, hyaline and branched. The hyphae are both intercellular and intracellular. They form rudimentary haustoria in the host leaf cells but in the tubers haustoria are more common and elaborate. The mycelium overwinters in the infected tubers. In the temperate regions the fungus penetrates in soil in the form of sporangia and germ tube.

The infected tubers are generally considered as the main source of primary infection in India. The fungal parasite overwinters as a dormant mycelium in the infected tubers. It becomes activated at the time of germination of the diseased seed tubers among the planting stock or waste tubers in dump heaps or infected tubers remaining in the ground after a previous crop. The second view is that the thick walled oospores which are found in abundance in the infected tubers are important overwintering structures.

They play a significant role as a source of primary infection. The infected sprouts emerge above ground and produce shoots which contains the mycelium. It grows and ramifies in the intercellular spaces and gives out hyaline, branched, indeterminate sporangiophores through the stomata of the host leaves. The thin walled, ovoid or lemon shaped sporangia are borne singly at the tips of the sporangiophores or their branches. The mature sporangia are detached and spread by splashing rain or air currents to new potato plants. On reaching a suitable host the sporangia germinates on the leaves. Germination is influenced by moisture and temperature conditions.

a) Indirect germination: In cool and moist weather the sporangia function as zoosporangia. The protoplasmic contents of sporangium divide to form a number of biflagellate zoospores. They are liberated and come to rest, retracts their flagella and secretes a wall around it. These zoospores germinate rapidly at 12° to 15°C.

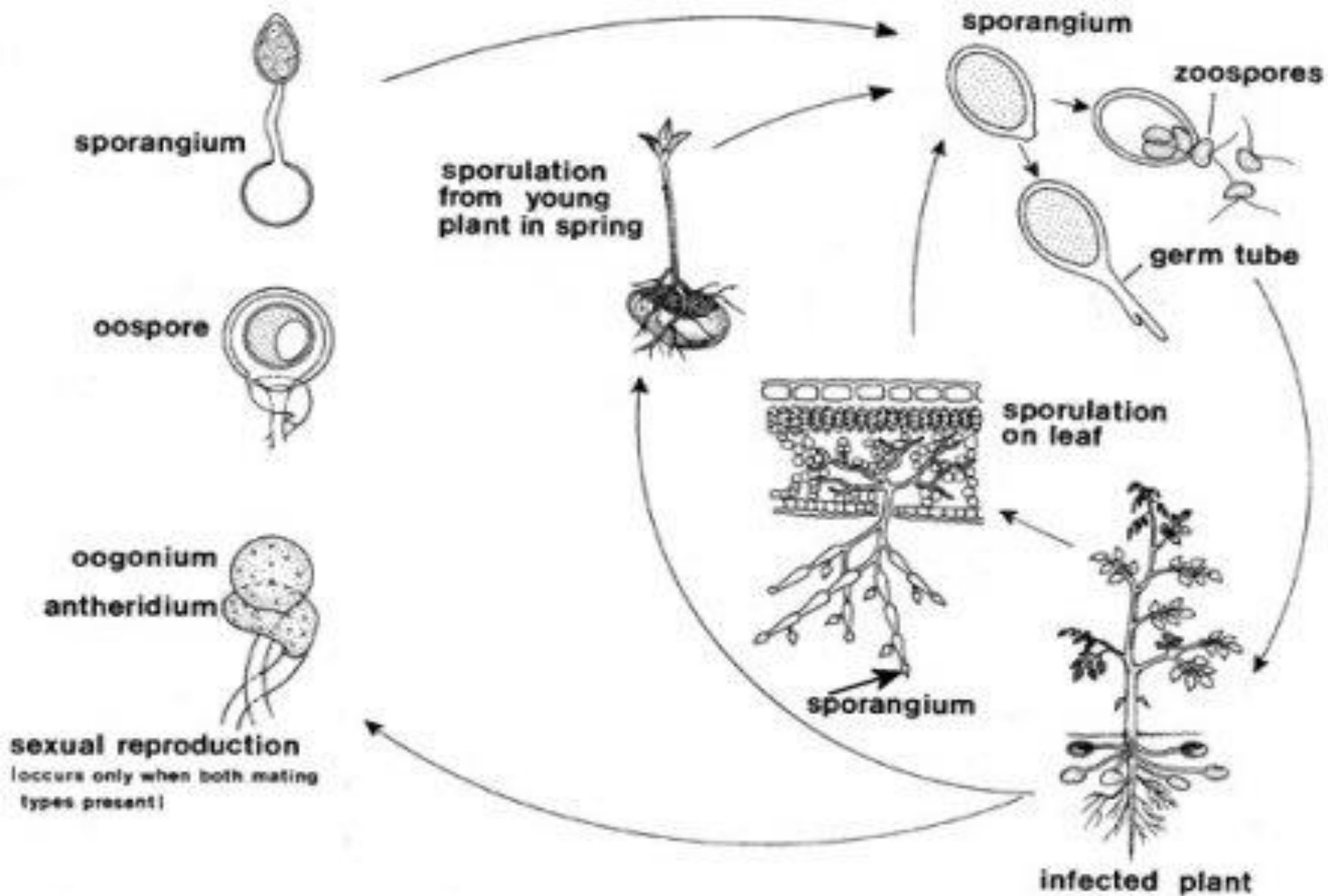
b) Direct germination: Under dry and warmer conditions, the sporangium functions as a conidium. It directly put out germ tube. The temperature for direct germination of sporangia is about 24°C or 25°C.

The infection thread produced on the surface of the host leaf enters the tissue. It penetrates through the cuticle or stomata. The lower surface is more susceptible than the upper surface of the leaf. The infected leaves produce another crop of sporangia which are carried by wind to healthy plants. This constitutes secondary infection and the process is repeated. As a result the disease spreads during the growing season over large tracts under potato cultivation.

Infection in the tubers is caused by zoospores produced in foliage lesions or present in the contaminated soil. Sporangia and zoospores come contact with the tuber in two ways. First, by contact of freshly lifted healthy and wounded tubers with diseased plants and contaminated soil. Secondly, during crop growth the zoospores and sporangia washed down the stems in to the soil by rain come in contact with the tubers. After germination, the germ tube enters through the eyes, wounds and lenticels.

The severity of the disease is governed by following environmental conditions:

- a) Night temperature below dew point for 4 or more hours.**
- b) Minimum temperature 10°C or slightly above.**
- c) Mean cloudiness on the next day.**
- d) Rainfall during 24 hours at least 0.1 mm.**



This is a simplified disease cycle for late blight of potato.

Control measures:

- 1. Selection of seed tubers: The seed tuber should be free from the disease.**
- 2. Storage of seed tubers at 40° F or below: Storage of tubers in cold storage rooms reduces or even checks the progress of disease.**
- 3. Growing disease resistant varieties: Some disease resistant varieties developed in India are Kufri Naveen, Kufri Jeevan, Kufri Alankar, Kufri Badshah, Kufri Swarna, Kufri Moti and Kufri Muthu.**
- 4. Use of fungicides: Fungicides were applied before infection by spraying or dusting. Timely and repeated spraying of copper fungicides such as Perenox, Blitox-50 and Fytolan is effective. Diathane Z-78 and Diathane M-22 proved to be more effective than the copper fungicides. The spraying should when the plants are 8 inches tall and continue until the harvest time at 10 days interval. In Assam, Brestan 60, Diathane M-45 and Zineb are useful for blight control. Mancozeb and Chlorothalonil are major fungicides used in present days. Each inhibits sporangial and spore germination.**

5. Sanitation: destruction of potato tuber refuge from pits and store houses is another practical measure for control.

6. Tuber treatment before storage: The tubers should be dipped in 1:1000 mercuric chloride solution for 90 minutes before storage and should be washed before use.

7. Injuries to the tubers should be avoided at harvesting.

8. In cool humid area killing of foliage before harvest proves beneficial. This is accomplished by spraying with herbicides or flame throwers or by use of mechanical vine beaters.

Thank you