



B.Sc. Third Year, Semester - V
Botany Paper No. XVI (C)
Plant Pathology Unit-2

5) Cash crops

b) Downy Mildew of Grapes



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b) Downy Mildew of Grapes

Causal organism: *Plasmopara viticola*

Host: *Vitis vinifera* (Grapes)

- **Classification**
- **Division-** Mycota
- **Sub Division-** Eumycotina
- **Class-** Oomycetes
- **Order-** Perenosporales
- **Family-** Perenosporaceae
- **Genus-** *Plasmopara*
- **Species-** *viticola*

Distribution

This disease was known to be endemic to the U.S.A. before 1870. However, since 1875 its epidemics were known to occur in France where it caused heavy losses to wine industry. At present the disease is known to occur in all wet grape vine growing areas of the world. In India the disease is common in Maharashtra. Downy mildew affects the leaves, fruits and vine and causes losses through necrosis of leaf tissues and defoliation; low quality and destroyed fruits; dwarfing and killing young shoots.



Symptoms:



Symptoms:

Symptoms of the disease appear on all aerial and tender parts of the vine. They are more pronounced on leaves, young shoots and immature berries.

On young leaves, first symptoms appear as oil spots circular yellow translucent lesions, often surrounded by brown halo on the upper surface. Later spots may coalesce to cover the entire surface. Masses of white downy sporangiophores and sporangia develop on the underside of each oil spot. During hot and dry weather or after sporulation the oil spots turn brown or reddish brown, dry out and die. On mature leaves, these appear a mosaic of small, angular, yellow to reddish brown lesions on upper surfaces limited by veins. Severely infected leaves fall prematurely. When young shoots and tendrils are infected, they turn brown and become stunted, distorted and necrotic.

Symptoms:

Infected inflorescences first turn yellow brown and may develop white brown sporangia during periods of high humidity at nights. When young peduncles are infected, entire cluster may die. Occasionally, parts of clusters wither and dry when only pedicels are infected.

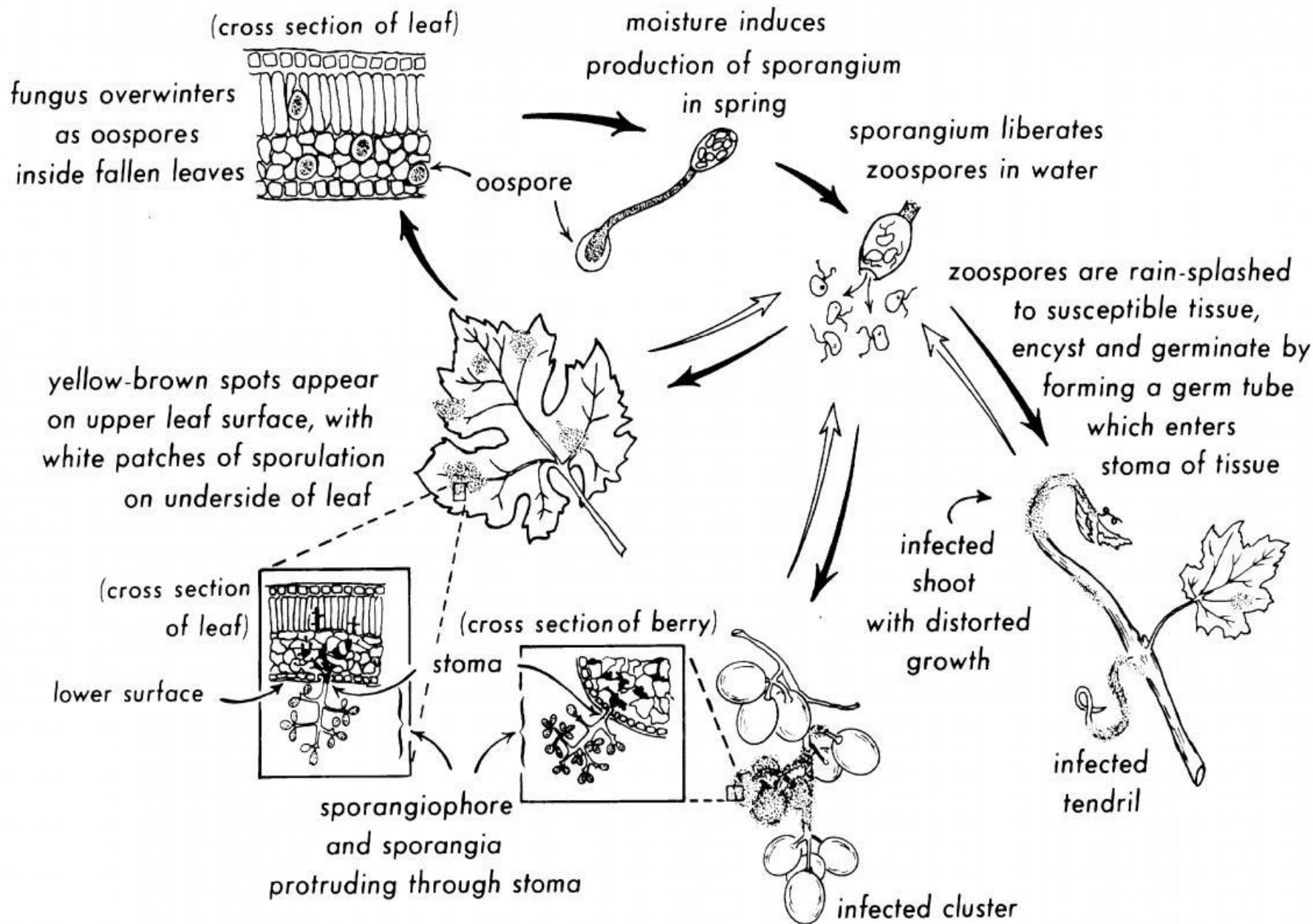
Young berries are most susceptible to infection from setting until 5 to 6 mm in diameter. Infected berries stop growing, harden and become leathery and wrinkled dull bluish green before turning brown, withering and falling from clusters. Older berries may be resistant, but they may be killed when pedicels and cluster stems are diseased. Infection of green young shoots, tendrils, leaves, stems and fruit pedicels result in stunting, distortion and thickening of tissues. Entire shoots may become covered with white downy growth of the fungus.

Causal organism and disease cycle:

The disease is caused by *Plasmopara viticola*. The fungus has intercellular mycelium with thin walled and hyaline hyphae. Their width may be 1-2 to 60 microns. Haustoria are spherical in shape. In humid weather, 4 to 6 sporangiophores emerge through each stomata on the under side of the leaves and on the stems or very rarely by pushing directly through the epidermis. In young fruits these emerge through lenticels. Each sporangiophore produces 4-6 primary branches nearly at right angles to the main axis. Each primary branch produces 2-3 secondary branches, in a similar way. At the tip of secondary branches, single lemon shaped sporangia are formed. The sporangia are blown by wind or rarely transported by water. Each sporangium germinates in presence of free moisture to produce 1-6 zoospores. The zoospores swim for some time, encyst and then produce germ tube which penetrates the plant. The fungus also produces oospores mostly in tissues adjacent to the midrib. Oospores are thick walled and germinate to form a germ tube that bears an apical sporangium. The sporangium produces 8-20 zoospores which may infects the host plant.

Causal organism and disease cycle:

In those areas where grape vines remain evergreen the pathogen may survive as mycelium in twigs. However, the main sources of survival are the oospores, embedded in dead leaves and occasionally in dead berries and shoots. Dead leaves and shoots degenerate and release oospores in soil. They germinate either on the ground or on grape plant on which they are carried by wind or splashing rain drops. The zoospores infect wet leaves, penetrating them through stomata. The mycelium develops inside the leaf. From this mycelium, sporangiophores are produced and the sporangia from them are carried by wind or rain to healthy plants. Zoospores from these sporangia cause secondary infections through stomata or lenticels, thus spreading the disease rapidly in orchard. In the stem, it invades the cortex, ray parenchyma and pith. Infected stem becomes distorted and hypertrophied, that may be finally killed. At the end of growing season oospores develop in leaves and sometimes in shoots and berries.



Control measures:

- Sanitation: fallen leaves and twigs should be collected and burnt.
- Plantation: Planting vines with proper spacing reduces humidity and allows free aeration.
- Plants should train in such a manner that leaves do not remain near the ground.
- Use of resistant varieties: Amber Queen, Champiun, Cardinal, Champa, Red Sultana.
- Use of fungicides: Fungicide sprays have been found quite effective in preventing secondary spread of downy mildew. Zineb or Maneb (0.2%), Captan (0.2-0.5%), Bordeaux mixture (4:4:50), or copper oxychloride such as Blitox-50 (0.3%) should be sprayed according to the following schedule:
 - i.immediately after pruning,
 - ii.three to four weeks after pruning,
 - iii.before the buds open,
 - iv. when berries have formed, and
 - v. during growth of shoots.

Spraying should be stopped two weeks before harvest. Some workers have found aureofungin as an antibiotic effective against the disease. Among newer fungicides, metalaxyl (Ridomil) has been effectively used against downy mildew of grapes. It inhibits sporangial formation through action of its volatiles.

Thank you