

DISEASES OF MULBERRY

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Theni

List of diseases:

- ✓ Powdery mildew: *Phyllactinia corylea*
- ✓ Leaf rust: *Peridiospora mori*
- ✓ Leaf spot: *Cercospora moricola*
- ✓ Sooty mould: *Capnodium* sp.
- ✓ Fungal leaf blight: *Alternaria alternata*,
Fusarium pallidoroseum
- ✓ Root rot / wilt:
Rhizoctonia bataticola (= *Macrophomina phaseolina*);
Associated secondary microbes: *Fusarium solani*/
F. oxysporum/ *Botryodiplodia theobromae*
- ✓ Bacterial leaf spot: *Pseudomonas syringae* pv. *mori*

Powdery mildew : *Phyllactinia corylea*

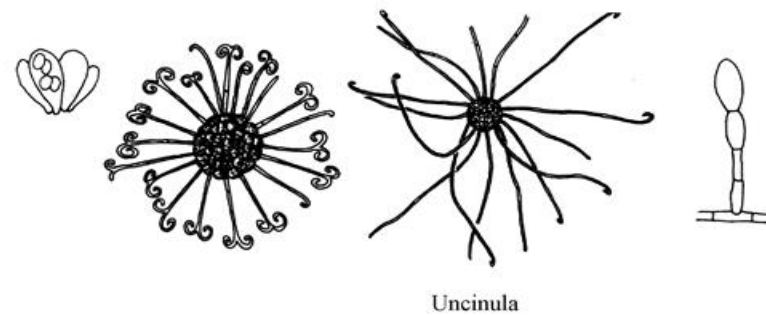
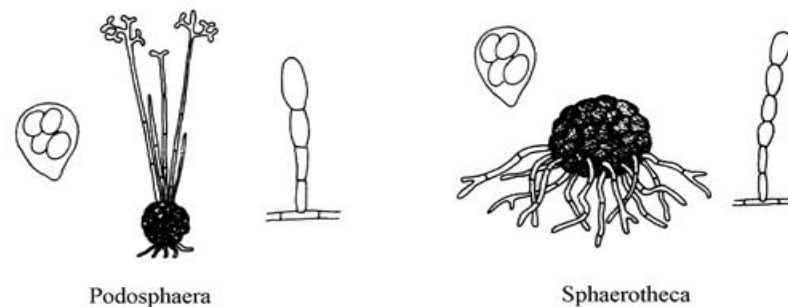
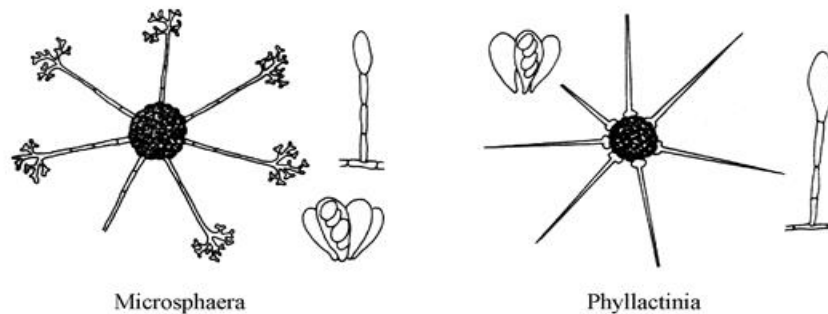
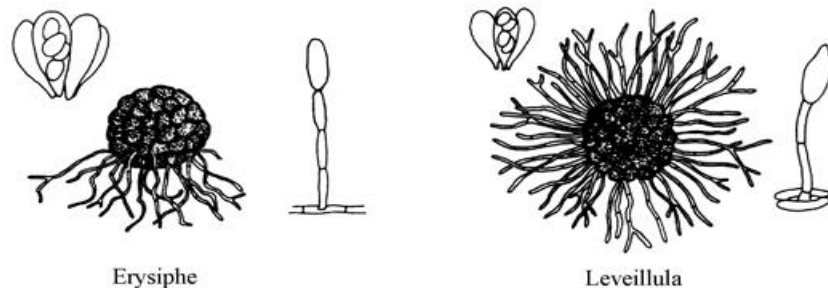
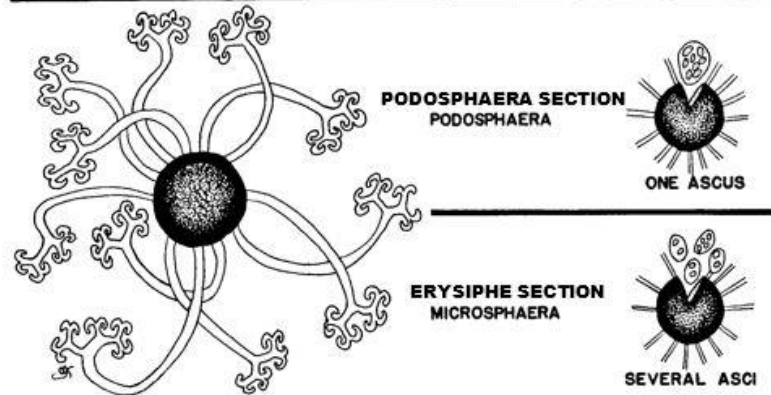
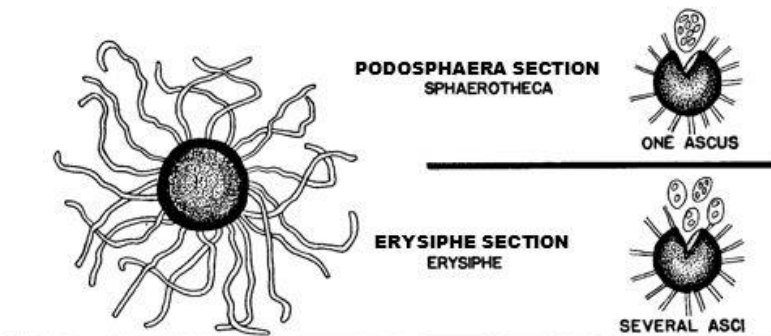
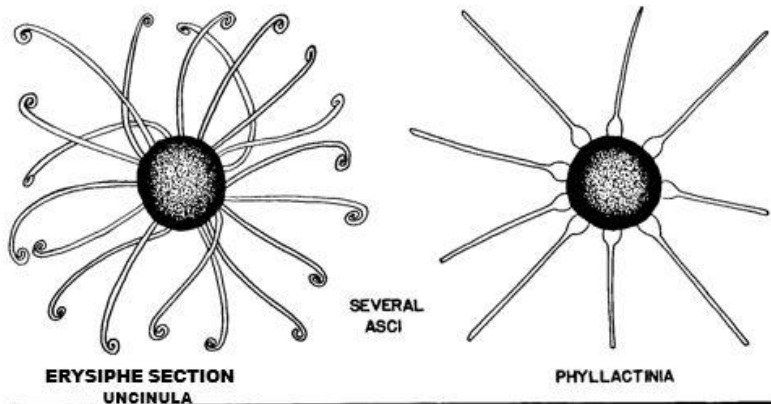
Symptoms:

- White powdery patches appear on the lower surface of leaf which is gradually increased and cover whole leaf surface.
- Affected leaves turn yellowish and defoliate prematurely





Key to Genera of Powdery Mildew Fungi



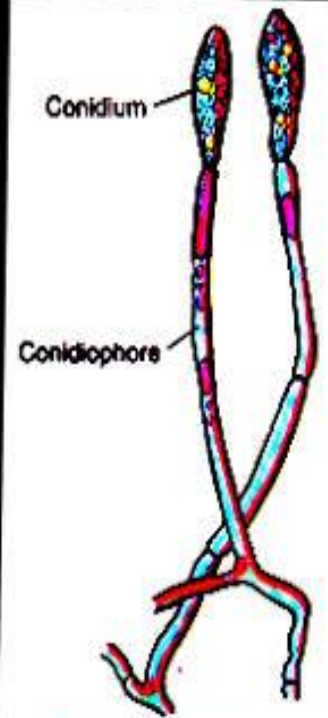
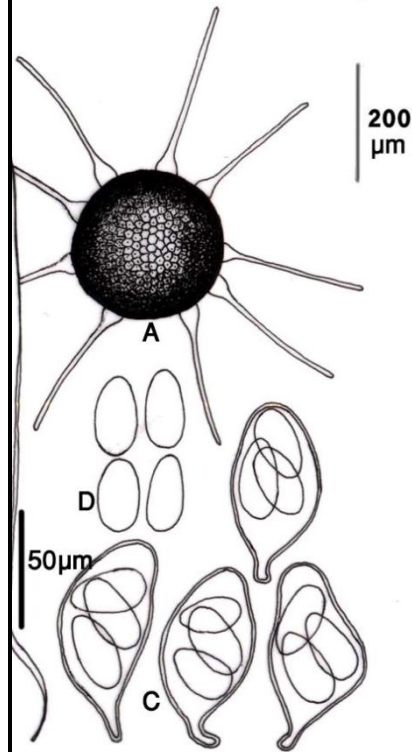
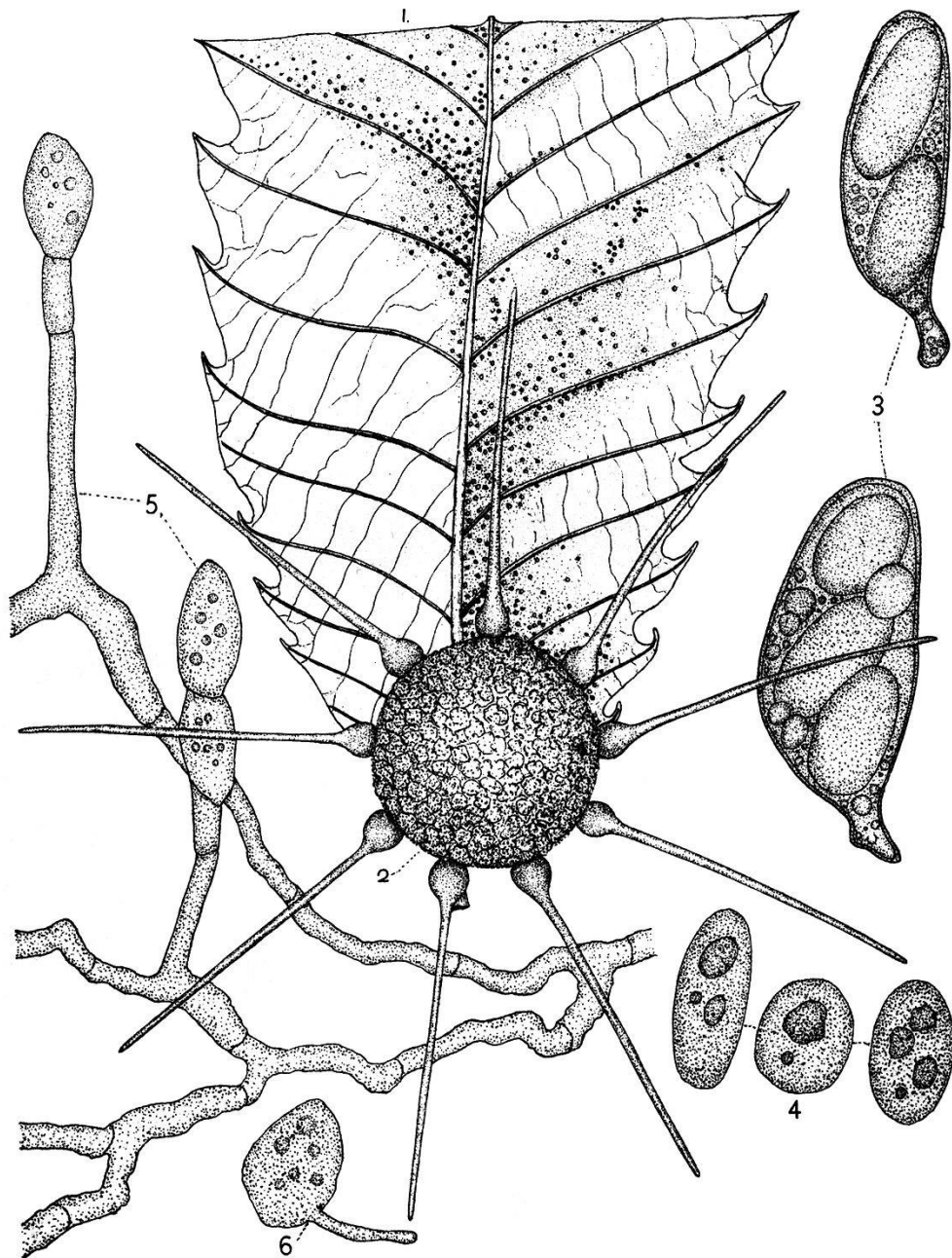
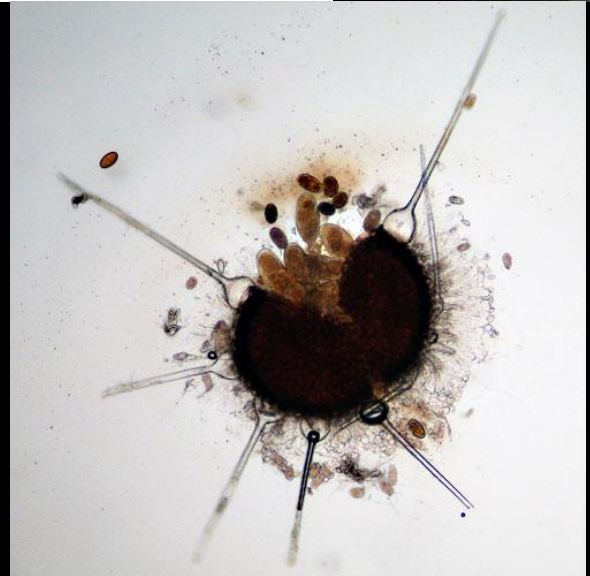
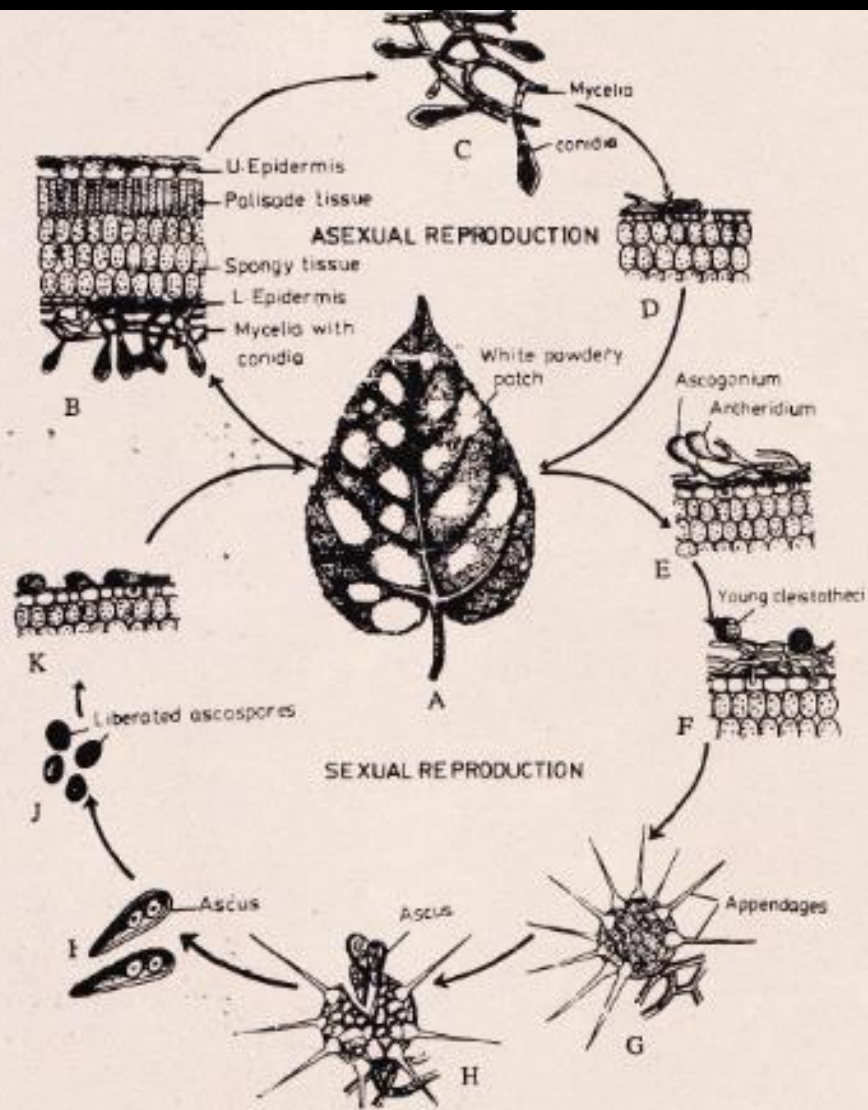


Fig. 11.10. *Phyllactinia* sp.
Conidiophores and Conidia.



Pathogen:

- *P. corylea* is an ectoparasiting which obtains nutrients by sending haustoria into the epidermal cells through the stomata.
- The mycelium is unbranched hyaline and forms a mycelial mat and sticks to the leaf surface using globed adhesive bodies which is similar to appressorium in morphology.
- Asexual spore: Conidia (hyaline, unicellular, club shaped borne on septate conidiophore)
- Sexual reproduction takes place by the formation of fruiting bodies, called cleistothecium by the union of antheridium and ascogonium
- Sexual spores: Ascospore (5-50 asci; 2 ascospores)



- A. Mulberry leaf affected by powdery mildew
 B. T.S. of infected leaf
 C. Mycelia with conidia
 D. Germinating conidia
 E. Ascogonium & antheridium
 F. Young cleistothecium

- G. Matured cleistothecium
 H. Liberation of asci
 I. Ascus
 J. Ascospores
 K. Germinating ascospore



Favourable Conditions

- Continuous rainy weather.
- Low temperature (20-25°C).

Management

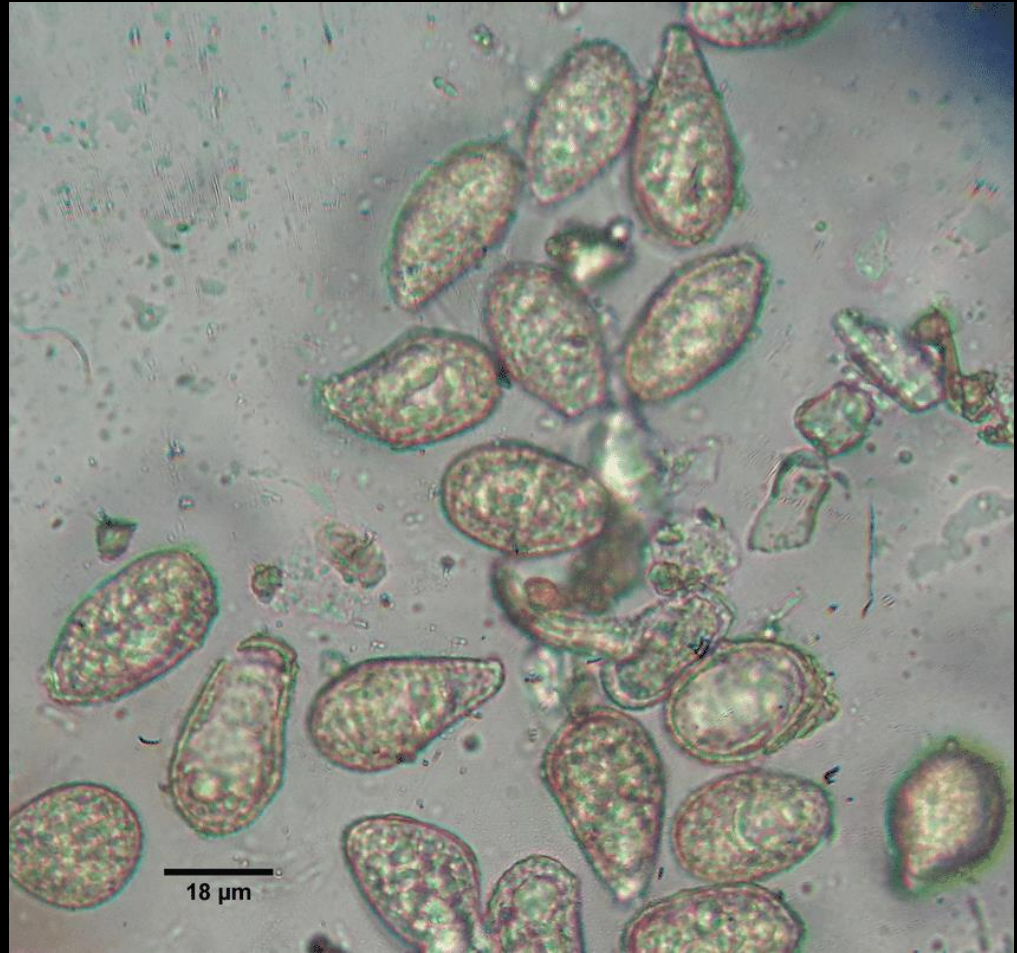
- GRV: Kalia kutahi, Mandalaya, Almora local, Himachal local, Punjab local, Katania, China-white, Jodhpur
- Follow wider spacing of plantation (90 cm x 90 cm) or paired row planting system [(90 +150) × 60 cm]
- Spraying of 0.2 % Karathane (Dinocap 30% EC) / Bavistin on the lower surface of the leaves. Safe period 5 days or spray Sulfex (80WP) 0.2%, safe period 15 days.

Leaf rust : *Peridiospora mori*

Symptoms:

- Several small pin head shaped brown pustules appear on the lower surface of mature leaves
- Reddish brown spot appear on the upper surface of the infected leaves
- Severely infected leaves turn yellowish and margin of the leaves become dry
- Initially, circular pinhead sized brown eruptive lesions appear on the leaves and later leaves become yellow and wither off.





Urediniospores of *Cerotelium fici*

Disease cycle:

- The disease is air borne spreading by conidia primarily through rain droplets.
- Temperature of 24-26 °C and 70-80 % relative humidity are most congenial for the disease development.

Management:

- Follow wider spacing of plantation (90 cm x 90 cm) or paired row planting system [(90 +150) × 60 cm].
- Avoid delayed leaf harvest.
- Spraying 0.2% Kavach (Chlorothalonil 75 % WP) on the leaves.
- Safe period: 5 days.

Leaf spot: *Cercospora moricola*

Symptoms:

- ✓ Brownish necrotic, irregular spots appear on the leaf surface. Spots enlarge, extend and join together leaving characteristic 'shot hole'. Leaves become yellow and wither off as disease becomes severe.

Favourable Conditions

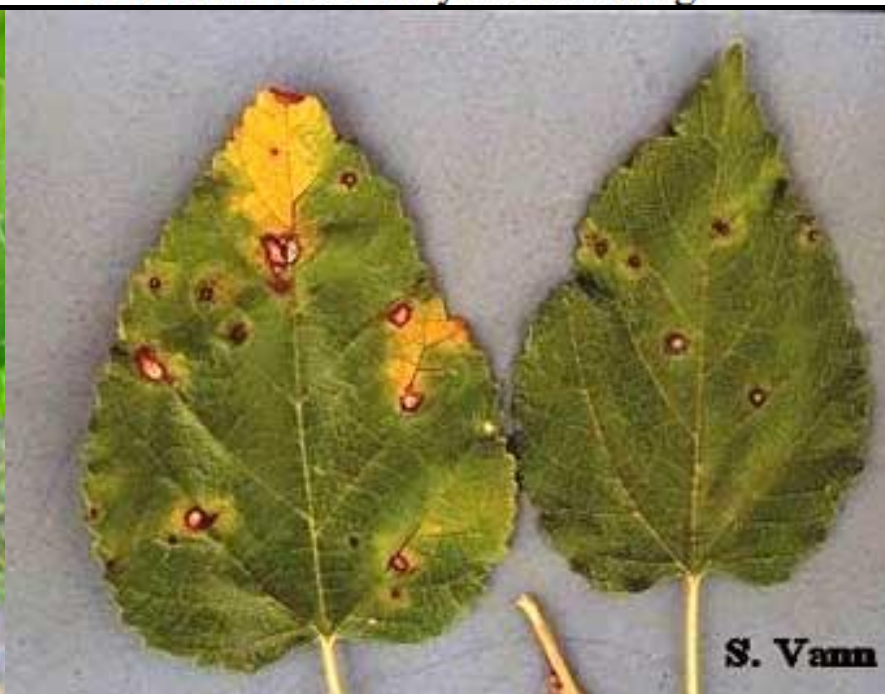
- The disease is air borne dispersing by uredospores through water droplets and wind current.
- Temperature of 22-26° C and high relative humidity above 70 % are favourable



FIGURE- 3. A leaf with characteristic spots



FIGURE-4. Severely infected twig

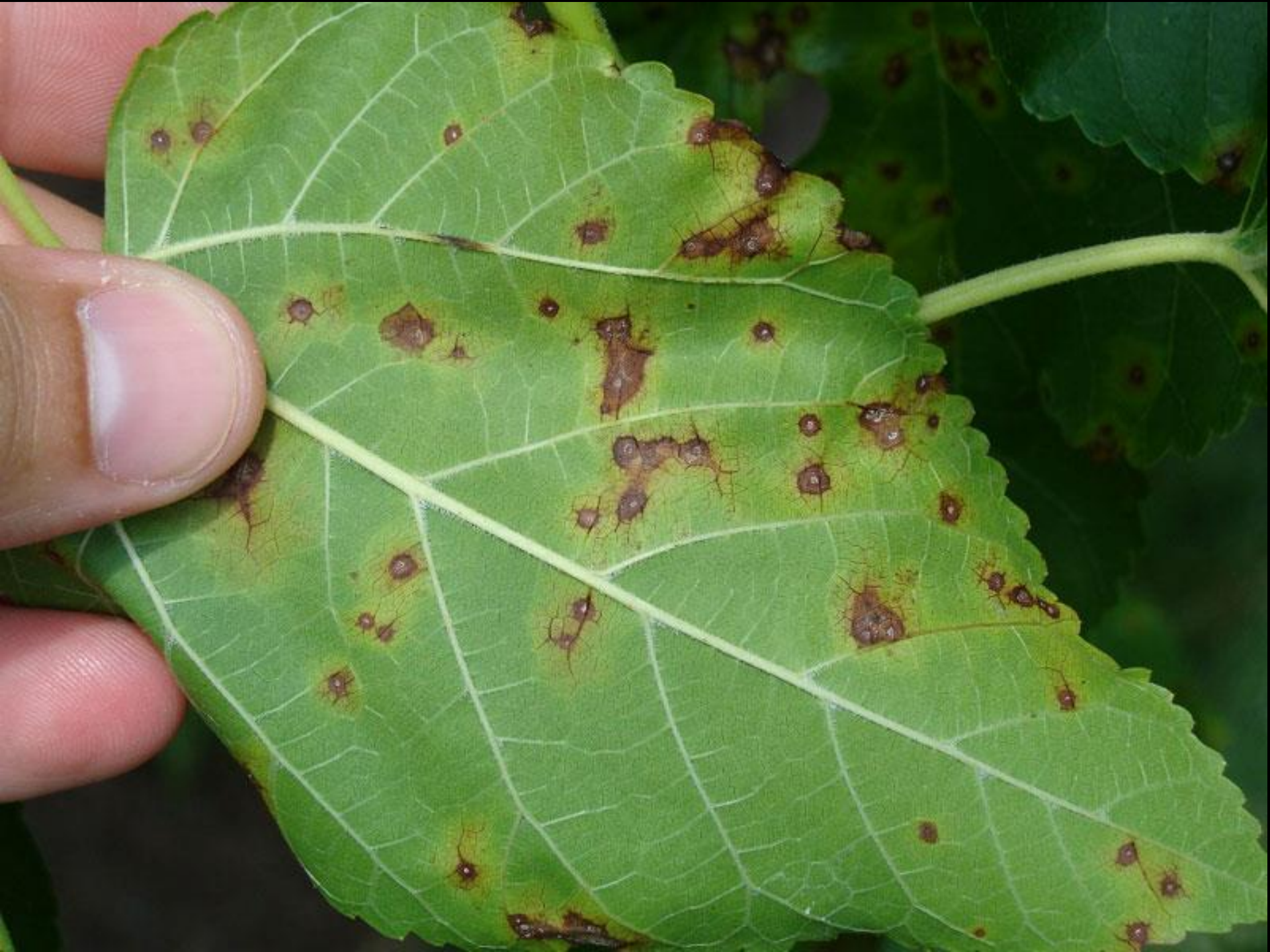


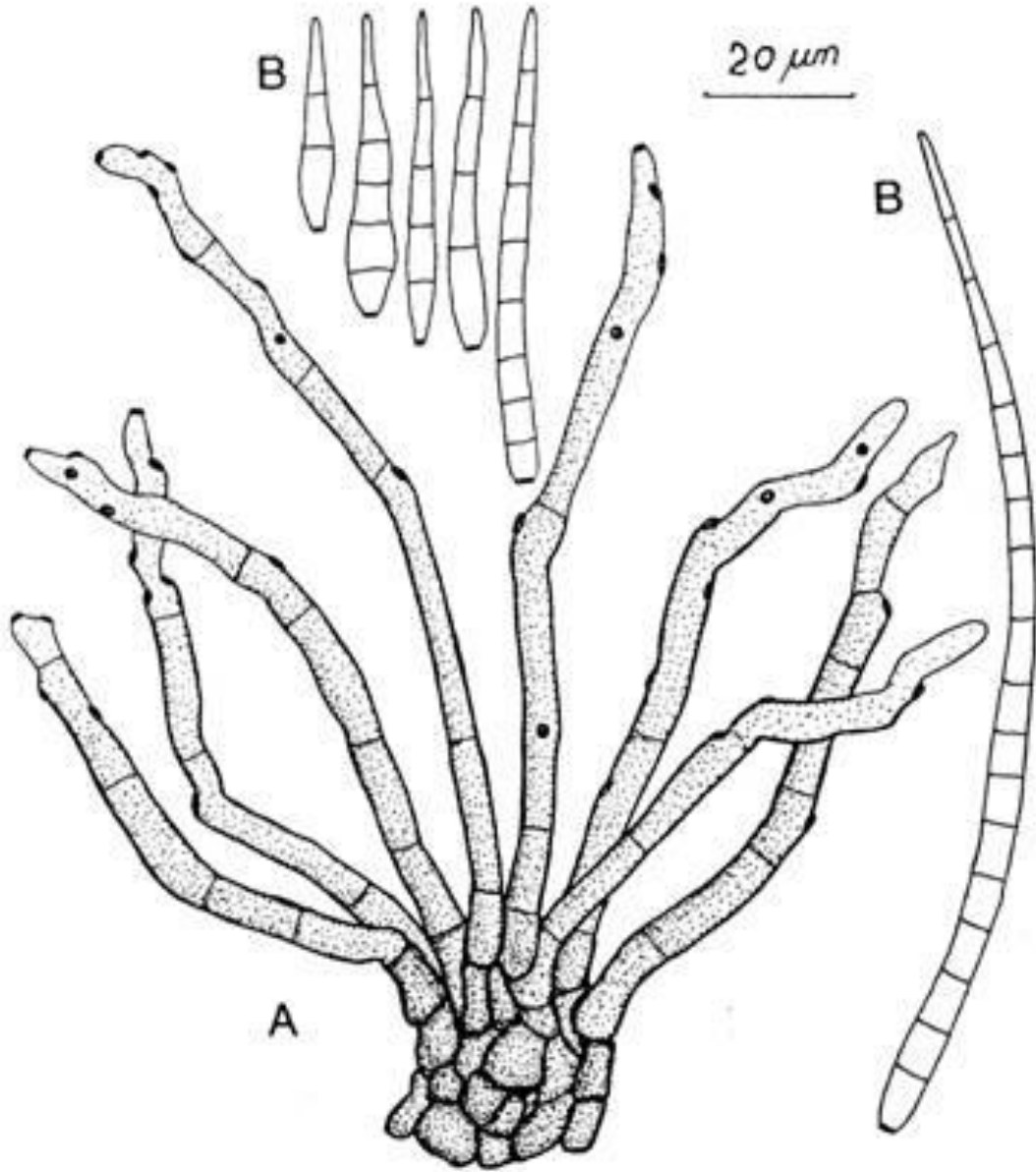
S. Vann



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10mm

Pathogen

- The fungus, *C. muricola* produces a compact mass of interwoven cushion-like hyphae which produce conidia on conidiophores.
- Conidia are 3-7 cell hyaline, tapering.

Favourable Conditions

- High atmospheric humidity (85-90 %).
- Low temperature (16-20°C)

Management

- Spraying of 0.2 % Bavistin (Carbendazim 50% WP) / Foltaf (Captafol) 0.2% solution on the leaves.
- Safe Period: 5 days.

Sooty mould: *Capnodium* sp.

Symptoms: Thick black coating developed on the upper surface of the leaves

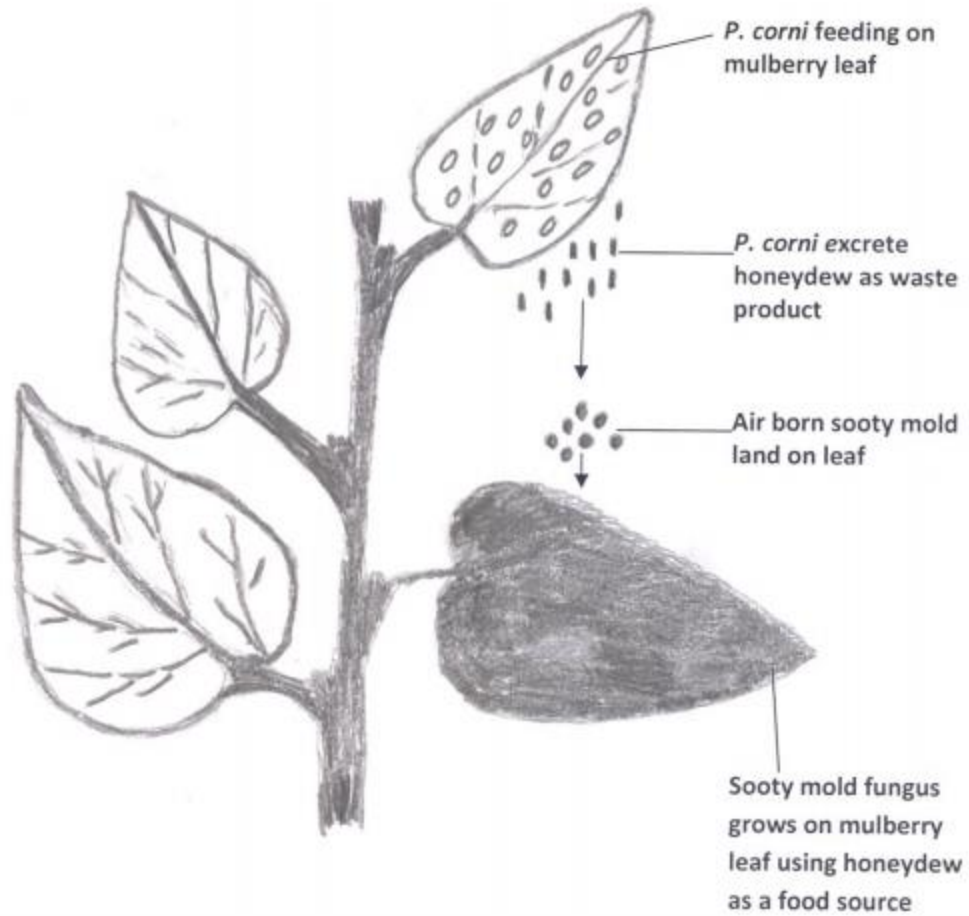


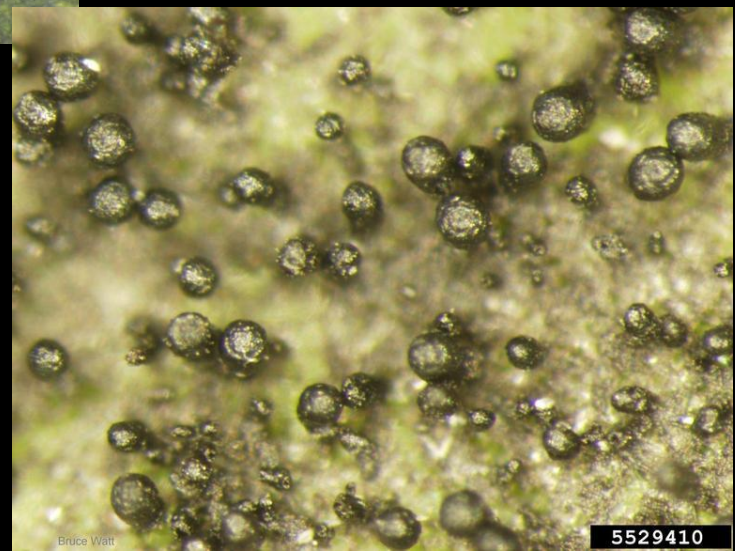
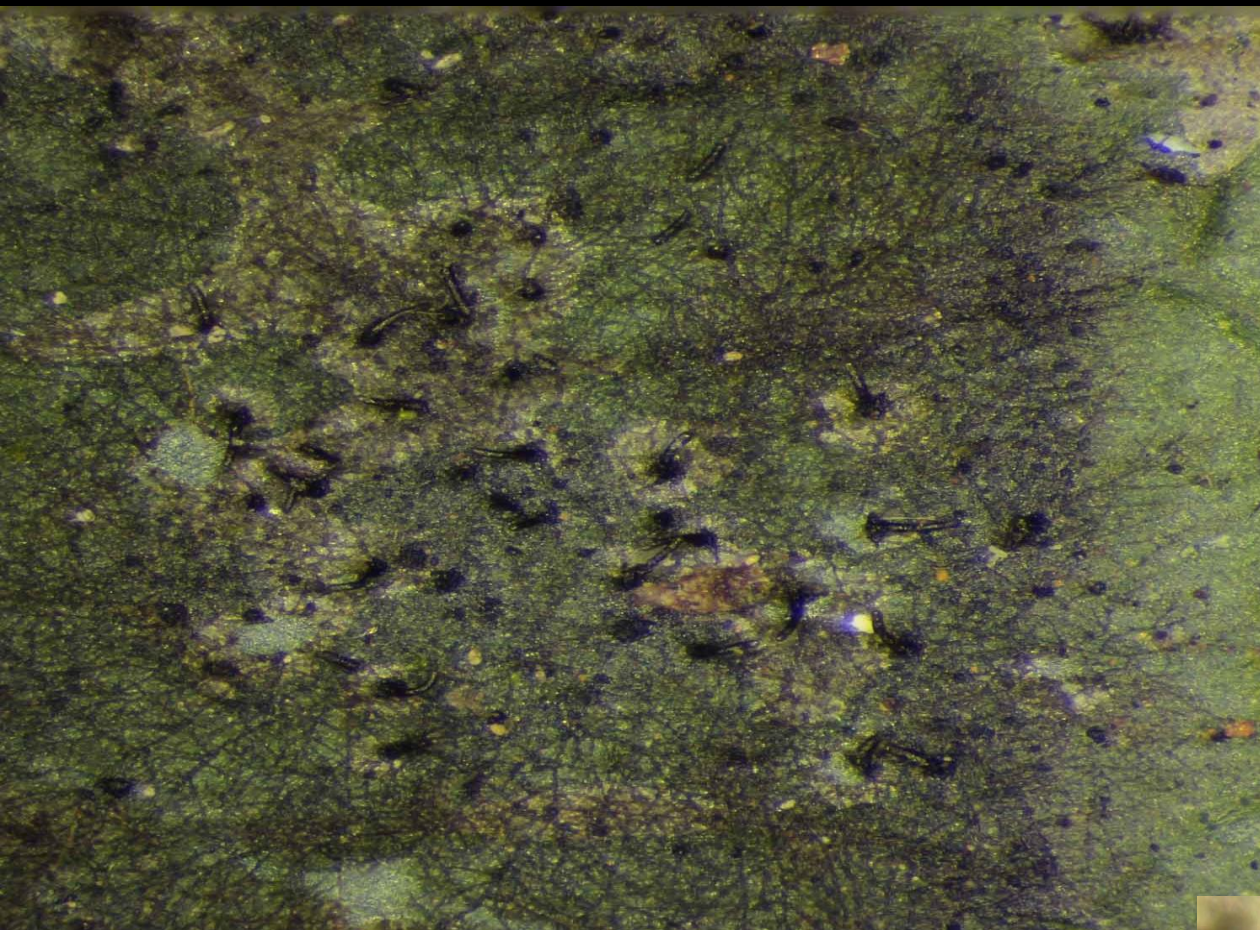
Some common genera causing sooty molds are *Capnodium*, *Cladosporium*, *Aureobasidium*, *Antennariella*, *Limacinula* and *Scorias*

Small scale insect
Parthenolecanium corni
Bouche (Hemiptera: Coccidae)



The leaves were covered with sticky black material, hard to rub off with finger tip.







Anamorph



Teleomorph

Pathogen:

- Sooty moulds with spherical, usually ostiolate ascomata; paraphyses usually absent or scarce; hyphae constricted at the septa, cylindrical

Favourable Conditions:

- High atmospheric humidity 85-90 %
- low temperature 16-20°C

Management:

- If ants are present and ground-nesting, kill them with boiling water, if it is possible to do that without damaging the crop plants. Without the ants, predators and parasites will bring about natural control (other methods of ant control are given below).
- Prune low-hanging branches of trees and shrubs, and remove weeds, to stop ants reaching the sap-sucking insects.

Management:

- ✓ Use soap sprays (5 tablespoons of soap in 4 L water or 2 tablespoons of dish-washing liquid in 4 L water), or use commercial white oil (petroleum oil) to kill the sap-sucking insects. These sprays work by blocking the breathing holes of insects causing suffocation and death.
- ✓ Spray the undersides of leaves; the oils must contact the insects. Use homemade oil spray by mixing together, 1 cup cooking oil, 2 cups water, 1 teaspoon dishwashing liquid. Dilute the mixture at the rate of 3 teaspoons per half a litre of water and spray on the infested leaves.
- ✓ The addition of malathion is useful against scales insects.
- ✓ Use synthetic pyrethroid insecticides to kill ants; these insecticides may also be tried against scale insects as they are likely to be effective against the crawlers -crawlers are the active nymphs which spread infestations to new plants and/or new gardens

After that spray starch solution (1kg Starch/Maida in 5 litres of water. Boiled and dilute to 20 liters)

Fungal leaf blight: *Alternaria alternata*, *Fusarium pallidoroseum*

- The disease starts as browning/ blackening of leaves starting either from the leaf tip or edges of leaf lamina in the form of isolated irregular brown coloured patches.
- As the disease spreads the entire leaf surface is affected resulting in fall of leaves.

Epidemiology

- The disease is air borne dispersing by conidia through water droplets and wind current.
- Temperature of 25-30° C and relative humidity of 40-60 % are favourable for the outbreak of fungal blights.

Management

- Remove the infested leaves, collect in a polythene bag and destroy by burning.
- Follow wider spacing of plantation (90 cm x 90 cm) or paired row planting system [(90 +150) × 60 cm]
- Spray 0.2 % Indofil M-45 (Mancozeb 75 % WP) solution on the leaves.





Root rot / wilt: *Rhizoctonia bataticola*

(*Macrophomina phaseolina*);

Associated secondary microbes: *Fusarium solani*/

F. oxysporum*/ *Botryodiplodia theobromae

- Initially the above ground symptom of the disease appears sudden withering of plants and leaves fall off from the bottom of the branches and progressing upwards.
- The below ground symptoms include decaying of root cortex or skin, turn black due to fungal spores/ mycelium below the bark.
- The severely affected plants loose the hold in the soil and can be easily uprooted.
- On severity, the entire root system gets decayed and plants die.
- Affected plants after pruning, either fail to sprout or plant sprouted bears small and pale yellow leaves with rough surface.





Management

- A target specific new formulation “Navinya” (herbal 80% & chemicals 20%) is used for the control of root rot disease of mulberry.
- (i.e. 1 kg Navinya in 100 liter water; sufficient for 100 plants @ 1 liter/plant)
- Application of Consortia : *T. v* + *P. f* + *B. s.* along with neem cake

Bacterial leaf spot: *Pseudomonas syringae* pv. *mori*

- It is common during rainy season when there is high humidity and temperature
- It shows numerous blackish brown irregular water soaked patches on the leaves resulting in curling and rotting of leaves

Epidemiology

- Though the disease is air and soil-borne, soil is the primary source of infection and the secondary infection through irrigation and cultivation practices.
- High temperature (28-30 °C) and high humidity (more than 80%) are favourable for the disease development.







Management

- Remove the infested leaves, collect in a polythene bag and destroy by burning.
- Follow wider spacing of plantation (90 cm × 90 cm) or paired row planting system [(90 +150) × 60 cm]
- Spray 0.2% Streptomycin solution or 0.2% Indofil M-45 (Mancozeb 75% WP) on the leaves.

Mulberry mosaic virus (MMV)
(*Begomovirus MMV*)









