# Lecture 07 - Disease of Apple (2 Lectures)

**Scab –*Venturia inaequalis***

**Symptoms**

Symptom appears on leaves and fruits. On lower side of the leaf lesion appear as olivaceous spots which turn dark brown to black and become velvety. On young foliage, the spots have a radiating appearance with a feathery edge. On older leaves the lesions are more definite in outline. The lesion may form a convex surface with corresponding concave area on the opposite side. In severe infection leaf blade curved, dwarfed and distorted. Fruits show small, rough, black circular lesions. The centre of the spots become corky and on mature fruits, yellow halo is seen around the lesions.

**Pathogen**

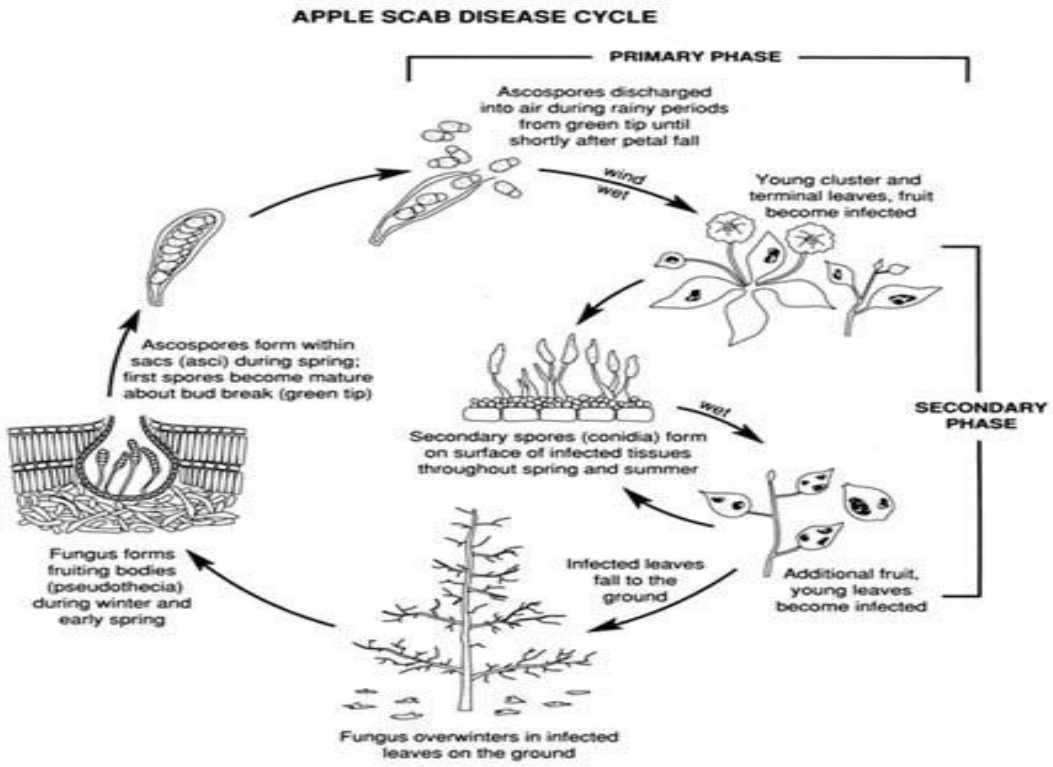
The mycelium is internal. Ascospores are two celled, greenish, grey or yellowish in color.

**Mode of Spread and Survival**

Pseudothecia formed in autumn and winter mature in spring to produce ascospores, the chief inoculum for primary infection. The secondary spread is through conidia.

**Disease cycle**

This disease, caused by the fungus *Venturia inaequalis* (anamorph *Spilocaea pomi*), may be quite severe when rainy, cool weather occurs in the spring. Fungal spores are produced in early spring on dead, fallen apple leaves about the time buds begin to develop. These spores are splashed by rain and blown by wind to land on developing plant tissue and initiate infections. After spots appear on the newly formed leaves, more spores are produced that spread infection to other parts of the tree. Again, rainy weather greatly encourages spore spread and infection during the secondary phase of spore production. The fungus over winters on fallen leaves.



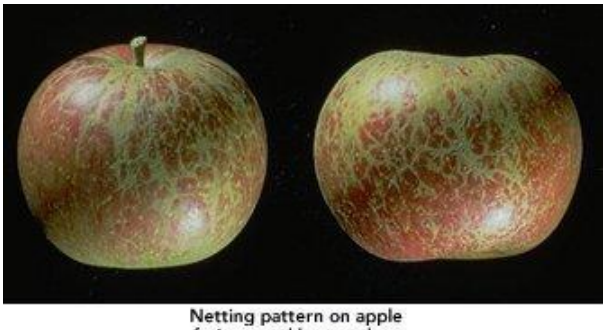

Clean cultivation, collection and destruction of fallen leaves and pruned materials in winter to prevent the sexual cycle. Spray Tridemorph 0.1% before flowering. Spray Mancozeb 0.25 % at bearing stage. Spray 5 % urea prior to leaf fall in autumn and 2 % before bud break to hasten the decomposition of leaves.

| S.No | Tree stage | Fungicide/100lit |
|---|---|---|
| 1 | Silver tip to given tip | Captafol 200 gm (or) Captan 300 g or Mancozeb 400 g |
| 2 | Pink bud or 15 days after 1 st spray | Captan 250 g or Mancozeb 300 g |
| 3 | Petal fall | Carbendazim 50 g |
| 4 | 10 days later | Captan 200 g.or Mancozeb 300g |
| 5 | 14 days after fruit set | Captofol 150 g |

Add stickers – teepol or triton 6 ml/10 lit of spray fluid.

**Powdery mildew – *Podosphaera leucotricha*.**

**Symptom**



Netting pattern on apple fruit caused by powdery mildew infection.

Malformation of apple leaves caused by powdery mildew.

Powdery mildew may be found on buds, blossoms, leaves, twigs, and fruit. In spring, infected flower buds open 5-8 days later than healthy buds. The buds are killed or distorted. Symptoms first appear in the spring on the lower surface of leaves, usually at the ends of branches. Small, whitish felt-like patches of fungal growth appear and quickly cover the entire leaf. Diseased leaves become narrow, crinkled, stunted and brittle, which results in their drying out and fall. The fungus spreads rapidly to twigs, which stop growing and become stunted. In some cases the twigs may be killed back. Leaves and blossoms from infected buds will be diseased when they open the next spring. Infected blossoms shrivel and produce no fruit. Fruit symptoms are not usually seen unless the disease has built up to high levels on susceptible cultivars. The fruit surface may become russetted or discolored, and dwarfed. Heavily mildewed trees are weakened, and are more susceptible to other pests and winter injury. It is the only fungal apple disease that is capable of infecting without wetting from rain or dew. In nurseries the fungus may spread to all developing leaves and cause stunting of vegetative terminal growth.

**Pathogen**

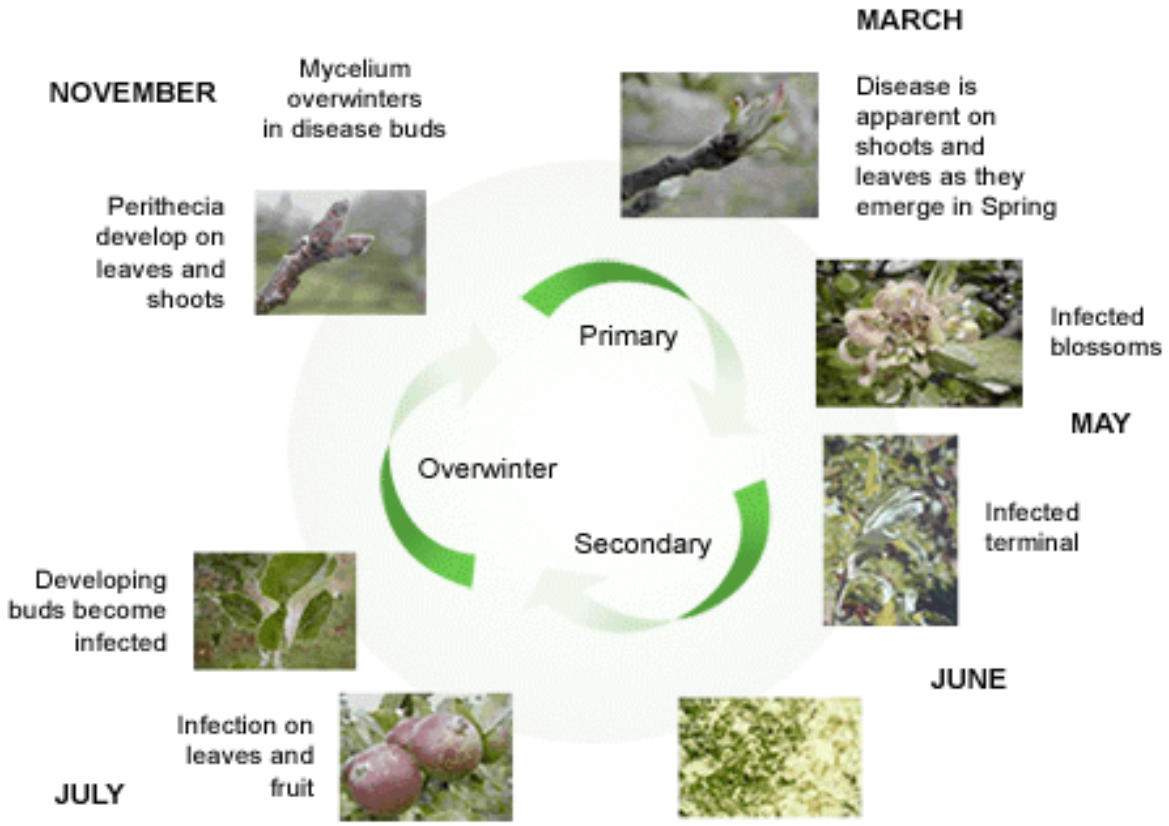
Powdery mildew is caused by, *Podosphaera leucotricha*, an ascomycetous heterothallic fungus. Conidia are ellipsoidal, truncate and hyaline. Perithecia are subglobose, are densely gregarious, and rarely scattered, and have apical and basal appendages. The asci in the perithecia are oblong to subglobose. Eight ascospores are present in the ascus. The fungus over winters as fungal strands (mycelium) in vegetative or fruit buds which were infected the previous season.

**Mode of Spread and Survival**

The fungus overwinters in the form of mycelium in diseased vegetative buds and fruits. Secondary spread is through wind borne conidia.

**Disease Cycle**

The mildew fungus over winters mainly as mycelium in dormant blossom and shoot buds produced and infected the previous growing season. Conidia are produced and released from the unfolding leaves as they emerge from infected buds at about tight cluster stage. Conidia germinate in the high relative humidity usually available on the leaf surface at 10-25˚C with an optimum of 19-22˚C. Germination does not occur in free moisture. Early-season mildew development is affected more by temperature than by relative humidity. Abundant sporulation from over wintering shoots and secondary lesions on young foliage leads to a rapid buildup of inoculum. Secondary infection cycles may continue until susceptible tissue is no longer available. Since leaves are most susceptible soon after emergence, infection of new leaves may occur as long as shoot growth continues. Fruit infection occurs from pink to bloom. Over wintering buds are infected soon after bud initiation. Heavily infected shoots and buds are low in vigor and lack winter hardiness, resulting in a reduction of primary inoculum at temperatures below -24˚C.



**Management:**

Spray Dinocap 0.05% or Chinomethionate 0.1%

**Fire blight- *Erwinia amylovora***

**Symptom**

The initial symptom usually occurs on leaves, which become water soaked, then shrivel turn brownish to black in colour and fall or remain hanging in tree. The symptom spread to twigs. Terminal twigs wilt from tip to downward and also spread to branches.Fruits becomes water soaked, turns brown, shrivels and finally becomes black. Oozing may be seen in the affected area.

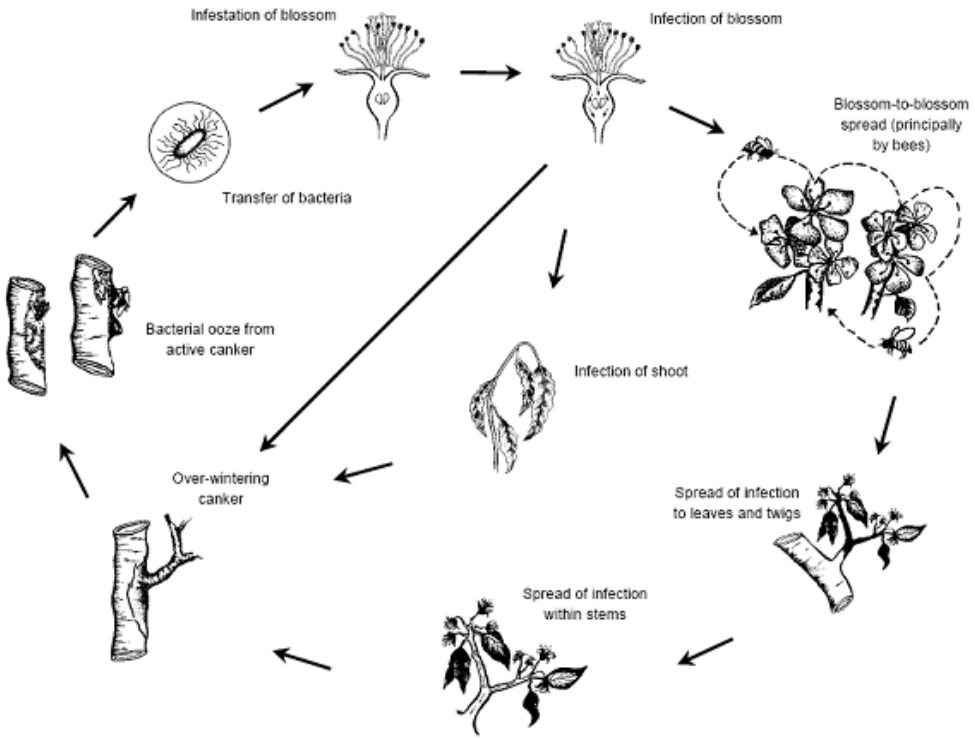
**Pathogen**

The bacterium is rod shaped and motile by peritrichous flagella. Bacterium occurs usually singly but pairs or chais of 3 of 4 bacteria also exist. Each bacterial cell is enclosed in a capsule.

**Mode of Spread and Survival**

The bacterium overwinters at the margin of cankers formed during previous season. They survive most often in large branches and seldom in twigs less than 1 cm in dia. Flies, Wasps and honey bees and rain splashes spread the bacteria into freshly wounded tissues inside the leaf. Young tender twigs are infected by bacteria through their lenticels, through wounds made by various agents and through insects carrying bacteria and feeding on the twigs.

**Disease Cycle**

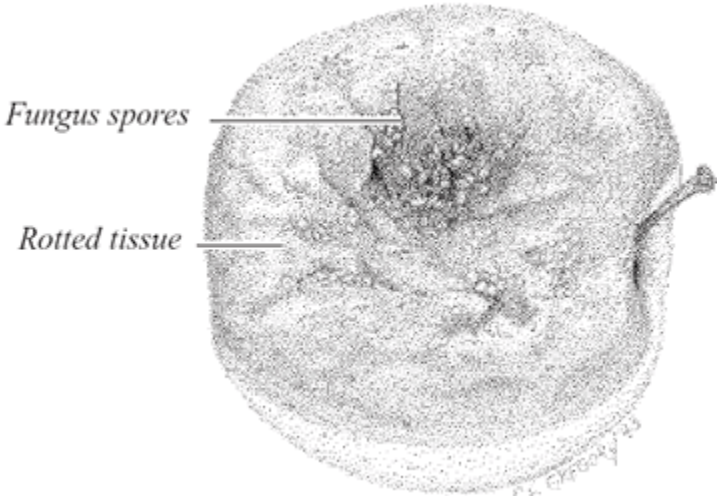



**Management**

Removal and destruction of affected parts. Removal of blighted twigs. Spray with Streptomycin 500 ppm.

**Soft rot – *Penicillium expansum***

**Symptom**




Young spots starts from stem end of the fruit as light brown watery rot. As the fruit ripens area of the rotting increases, skin becomes wrinkled. A peculiar musty odour is emitted

under humid condition a bluish green sporulating growth appears. Infection take place by wounds in the skin caused by insects and during handing in storage and transport.

**Pathogen**

Conidiophores give rise to 1-3 main branches. They in turn produce crowdwd whorls of branchlets. Conidia are formed in chains. Conidia are green or bluish green in mass**.**

**Mode of Spread and Survival**

The fungal spores are spread by air. Mycelium can infect through bruisedor wounded fruits in close contact. Infection of the fruit usually take place through wounds in the skin, such as wounds caused by insect bites, careless picking, rough handling during washing, grading , packing, transit and storage. Infection is also through lenticels.

**Disease cycle**

Spores of the soft rot fungus are present almost everywhere and can survive long periods of unfavorable conditions. Bulk bins, field crates, pack house lines, and storage rooms are usually contaminated. Injuries to fruit, especially during picking and handling operations, are the primary points of entry. At ordinary temperatures, infected fruit can rot in 2 weeks or less.

**Management**

Careful handling of fruits without causing any wounds. Dipping the fruits aureofunginsol @ 500 ppm for 20 min gives best control.

**Bitter rot – *Glomerella cingulata***

**Symptom**

Faint, light brown discolouration beneath the skin develops. The discolouration expands in a cone shape. The circular, rough lesions become depressed. The lesions increased and covers entire areas of fruits. Diny black dots appear beneath the cuticle which gives rise to acervuli . Pink masses of spores are found arranged in defined rings.

**Disease Cycle**

The fungus over winters in mummified fruit, in cracks and crevices in bark, and in cankers produced by the bitter rot fungus or by other diseases, such as fire blight. Jagged edges of broken limbs are also ideal sites. The bitter rot fungus is one of the few rot organisms that can penetrate unbroken skin of fruit. Although penetration is direct, wounds can be colonized rapidly by the fungus. Spores are waterborne and are released during rainfall throughout the growing season. Fruit infection can occur early but is more common from mid to late season. Often, the first infections appear in cone-shaped areas within the tree beneath mummies or a canker. Factors which determine the time of appearance of bitter rot are the maturity of fruit, temperature and humidity, and the presence of disease in the area. The optimum conditions for disease development include rainfall, relative humidity of 80 to 100 percent, and warm temperatures. Infection can occur in as little as five hours at 26˚C.

**Management**

Spray Mancozeb 0.25 % in field. Treatment with Mancozeb 0.25 % to check the disease in storage.