

MANGO DISEASES AND THEIR MANAGEMENT

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1. FLOWER DISEASES.

1.1 Powdery Mildew (*Oidium mangiferae*)

The symptoms can be noticed on the inflorescence, stalk of inflorescence, leaves and young fruits. The characteristics symptoms of disease are white superficial powdery growth of the fungus on these parts. The effective flowers may fall prematurely and young fruits may remain on the tree until they reach up the marble size and then drop prematurely. Dropping of unfertilized infected flowers and young fruits leads to serious crop loss (20-80%).



Conidia= 9-32 0C & >25% R.H.

Disease= 10-31 0C & 60-90% R.H.

Deficient in Phosphorus

Control:-

1. Pruning of diseased leaves and malformed panicles reduces primary inoculums.
2. Three sprays of systemic fungicides during flowering season are recommended at 12-15 days intervals.
1st spray is recommended when there is 25% flowers opening.

1.2 Anthracnose/ Blossom Blight (*Colletotrichum gloeosporioides*, *Alternaria sp.*)

Anthracnose manifests on different parts of mango tree. On the inflorescence, the earliest symptoms of the disease are the production of blackish brown specks on peduncles and flowers. Small black spots appear on the panicles and open flowers, which gradually enlarge and cause death of flowers. The infected flowers fall off, leaving the more persistence spikes on the peduncles, this leads to serious crop loss (10-90%).



25-30 0C & 95-97% R.H.

Excessive in Nitrogen

Control:-

1. Diseased leaves, flowers, twigs and fruits lying on the floor of the orchard should be collected and all infected twigs from the tree should be pruned and burnt.
2. Blossom infection can be controlled effectively by two to three sprays of contact or systemic fungicides during spring season at 12-15 days interval.

1.3 Mango malformation (*Fusarium mangiferae*)

Malformation is a serious threat to the mango growing areas of Pakistan as it causes crop loss upto 70%. Recent findings have demonstrated that the disease may be of fungal origin. Two distinct types of symptoms described by the workers are vegetative malformation (MV) and floral malformation (MF). Vegetative malformation is more pronounced in young seedlings as well as seedling trees than in the grafted plants. The affected seedlings developed excessive vegetative branches, which are of limited growth, swollen and have very short internodes.



Malformation of inflorescence (MF) is a disease of inflorescence. The most characteristic symptoms of (MF) are the reduction and compact of internodes giving malformation a broom like appearance.

Infected Grafting Material & wounds

Control:-

At present, no definite control measures for mango malformation can be advocated. However the following may reduce the incidence of malformation

- i. It is advisable to avoid scion stick from trees bearing malformed inflorescence for propagation.
- ii. Only certified saplings should be used for propagation.
- iii. As soon as the disease symptoms are well expressed, the affected terminals should be pruned along with the contiguous 15-20cm apparently healthy portion and burnt.

2. Leaf diseases:

Mango plant more or less is prone to various leaf diseases which are mentioned below but the most important ones are discussed in detail:

- 1) Anthracnose
- 2) Scab
- 3) Phoma blight

- 4) Grey blights
- 5) Alternaria leaf spot
- 6) Bacterial canker

2.1 Anthracnose (*Colletotrichum gloeosporioides*)

Characteristics symptoms appear as oval or irregular brown to deep brown spot of various sizes scattered all over the leaf surface. Under damp conditions, the fungus grows rapidly. Young leaves are more prone to attract than the older ones. Insect attack may facilitate the entry of pathogen resulting into heavy incidence of disease.



Control:-

- i. The foliar infection can be controlled by sprays of copper based fungicides during spring and after monsoon season.

2.2 Alternaria leaf spot (*Alternaria alternata*)

Symptoms first appear as small, brownish circular spots on the surface of leaves. Later on, high concentration of brown black spots occurs evenly over the leaf lamina. Symptoms are more prominent on the lower side of the leaves. The tender leaves are found to be more susceptible than mature ones.



Control:-

- i. The disease can be controlled by regular field spray program including copper based fungicides.

2.3 Bacterial Canker (*Xanthomonas mangiferae*)

On leaves, minute water soaked irregular to angular raised lesions is usually crowded at the apex. On young leaves halos are larger and distinct, while on older leaves, they are narrow could be observed only against light. Under severe infections, the leaf turns yellow and drop off.

25-30 °C & >90% R.H.

Rainy weather



Control:-

- i. Regular inspection of orchards, sanitation and

seedling certification are recommended as preventive measures against the disease.

- ii. Spray of copper based fungicides has been found effective in controlling bacterial canker.

3. FRUIT DISEASES / POST HARVEST DISEASES

3.1 Anthracnose (*Colletotrichum gloeosporioides*)

The disease is more common on young fruits and during transit and storage. Latent infection during pre-harvest stage is responsible for post harvest rots. On storage, black spots are produced. Initially the spots are round but later form large irregular blotches on the entire fruits the spots have large deep cracks and the fungus penetrates deep into the fruit causing extensive rotting.



Control:-

- i. Pre-harvest infections can be managed by spraying copper based fungicides after completion of heavy showers.
- ii. Post harvest infections can be managed as pre harvest sprays in the field to reduce the latent infection and treatment of the fruit with hot water/ fungicides after harvest to eradicate left over latent infection.

3.2 Stem End Rot (*Lasiodiplodia theobromae*, *Phomopsis mangiferae*, *Dothiorella doninicana*)

The fruit while ripening suddenly becomes brown to black typically at stem end. Within two three days whole fruit becomes a black and disease progress downwards, thus involving half of the area of the fruits. Though the flush of the whole fruit often wrinkles are also observed. Affected skin remains firm but decay sets into the pulp below and emits unpleasant odour.



Control:-

- i. Prompt and proper handling of the fruit can minimize disease incidence.
- ii. Fruit should be harvested with 10mm stalk.
- iii. Pre-harvest sprays of any systemic fungicides or copper based fungicides reduce the incidence of SER.

- iv. Post harvest dip of fruit in hot water supplemented with carbendazim or thiophanate methyl (0.05%) for 15 minutes at $52\pm1^{\circ}\text{C}$ control the disease.

4. DECLINE DISORDERS

Decline is a general term and mango plant is affected with different decline disorders which are usually associated with biotic as well as abiotic stresses.

1. Die back
2. Twig blight
3. Gummosis
4. Bark splitting
5. Bark scaling
6. Wilting
7. Mango Sudden Death Syndrome (MSDS)

The important mango decline disorders are described below:

4.1 Die back (*Lasiodiplodia theobromae*, *Natrassia mangiferae*)

The disease is noticeable throughout the year but it is most conspicuous during October and November. It is characterized by drying up of twigs from top to downward particularly in the older trees followed by drying up of leaves which gives an appearance of fire scorch. The upper leaves lose their color and gradually dry. Drying of the whole leaf is accompanied by upward rolling of the margin. Such leaves shrivel, fall off within a month leaving the shriveled twigs all together bare, which is the characteristic symptom in the advance stage of the disease.



Drought, hard pain, high temperature, weak trees, sun scorch, high humidity, nutrition deficiency & physical damage.

Control:-

- i. Pruning of affected twigs (3" below the infection site) followed by spraying of copper based fungicides is the most effective method for the control of disease.
- ii. In severe cases, the soil amendment with the removal of soil up to 9 inches deep under the canopy of the diseased tree and refilling with the canal silt, recommended doses of chemical fertilizers and FYM with pruning of

affected twigs followed by three consecutive sprays of copper based fungicides at 15 days interval is also recommended.

4.2 Twig blight (*Lasiodiplodia theobromae*, *Nattrassia mangiferae*, *Colletotrichum gleosporioides*)

Disease produces elongated black necrotic areas on the twigs.

The leaves droop down slowly during up and ultimately fall off. The very young braches start drying from tip downward.

Injuries, Insect attack, high temperature weak plant, water stress, frost & physical damage.



Control:-

- i. Diseased twigs lying on the floor of the orchard should be collected and all infected twigs from the tree should be pruned and burnt.
- ii. Foliar sprays of copper based fungicides reflect good control.

4.3 Gummosis (*Lasiodiplodia theobromae*)

About 30-40% of young mango trees are affected by the gummosis especially when the mango tree is planted in sandy soil but its prevalence has also been noticed in other mango growing soils. The disease is characterized by the presence of profuse oozing of gum on the surface of affected wood, bark of the trunk and also on larger branches but more common on the crack branches. In severe cases, droplets of gum trickle down on stem and bark turns dark brown with longitudinal cracks.



Injuries, high temperature, weak plants, water stress, sun scorch, high humidity, nutrient deficiency, physical damage and frost bite.

Control:-

- i. The disease can be controlled with the regular sprays of copper based fungicides.
- ii. The diseased bark / portion should be removed, cleaned and covered with copper based fungicides paste.
- iii. Application of copper sulphate 500g in the sandy soil around the tree trunk is also advocated.

4.4 Barks cracking (Unknown Aetiology)

Bark cracking is characterized by the development of deep longitudinal cracks. Rooting is not associated with the cracks but the underlying wood is found severely pitted. Gum pockets are also noticed along with the cracks. Later bark gets dried and pulled off resulting in girdling effects, yellowing and shedding of leaves followed by the die back of branches.



Sun scorching, water stress, physical damage, nutrition deficiency

Control:-

- i. Spraying of copper oxychloride.
- ii. Soil application of copper sulphate.
- iii. Removal of dead bark & pasting Bordeaux paste.

4.5 Root rot (*Rhizoctonia* sp.)

Infection occurs at/or below the ground level the circular to irregular water soaked patches. These patches enlarge and ultimately girdle the entire base of the stem. On account of rotting, the diseased tissues become soft, dark brown or black.



Control:-

- i. Soil treatment with Thiophanate methyl, carbendazim or copper oxychloride @ 2g/ft² is recommended.
- ii. During the growing period any copper based fungicide should be sprayed on the plants.

4.6 Mango Sudden Death Syndrome (*Ceratocystis fimbriata, Lasiodiplodia theobromae*)

Mango sudden death syndrome (MSDS) has become an important disease in Pakistan since 1997 which is closely associated with infections by *Ceratocystis fimbriata* possibly in concert with Botryosphaericaceous fungi like *Lasiodiplodia theobromae*. Improper irrigation and root injuries have been found as major predisposing factors for this disease. Affected mango trees have wilting symptoms. Cankers may develop over areas of vascular discoloration and the cankers may exude gum from the stem. Wilted leaves typically become dry and curled rather suddenly but remain attached to the tree for several weeks. It is a serious disease and aggravating day by day by which apparently healthy looking mango plants die within days and it is destroying the

precious wealth of Pakistan. Up till now 4-12% mortality rate has been observed in different mango growing areas of Pakistan.

Root injuries, insect infestation, improper irrigation.



Control:-

Early detection is very important for the proper management of this disease. For this purpose scientists have divided this syndrome into five categories (0-5 stages) with collective wisdom. The detailed pictorial presentation of each stage has been developed for the guideline of mango growers under ASLP project. However some important points are being discussed over here.

0 stage	=	No Disease
1 & 2 stage	=	Less than 50 % disease severity
3 & 4 stage	=	More than 50 % disease severity
5 stage	=	Dead & totally wilted plants

- i. Uproot the plants showing 3, 4 & 5 stages immediately and treat the soil with fungicide. Soil solarization of this area is also recommended.
- ii. Treat the plants falling in 1 & 2 stages with the following way:
 - a. Scratching of the infected portion followed by three pasting of Thiophanate methyl or Carbendazim @ 250kg/liter with one week interval
 - b. These fungicides may be injected thrice with the same interval @ 5g/20ml/hole with the formation of 4 holes on the main trunk of the tree having $\frac{1}{2}$ inch dia, 4-6 inch deep at 45°C . These holes should be made at 1 foot height starting from the ground level and covering the whole girth.

- c. Optimize the soil conditions of the diseased plants through the application of FYM phosphorus, potash and gypsum (if required).
 - d. Minimize the plant requirements through de-blossoming, timing of fruit, pruning and foliar spray of micronutrients.
- iii. The following recommendations are given for the plants showing no diseases (0 stage).
 - a. Do proper irrigation whenever it is required.
 - b. Keep the water 3 to 4 ft away from the stem by making “watt” or slope.
 - c. The area under canopy should be at field level.
 - d. Avoid intercropping in mango orchards.
 - e. Properly control bark beetle and termite infestation.
 - f. Follow departmental recommendation for fertilizer application.
 - g. Organic matter should be added in the form of FYM or green manure preferably every year.
 - h. Always avoid hoeing and ploughing in mango orchards.
 - i. Spray of Thiophanate methyl or Carbendazim @ 2g/liter must be included in spray schedule and it should be done in a way covering the whole area of the tree up to ground level.
 - j. Injections of these fungicides for healthy plants as preventive measure are also advocated.
 - k. The plants showing any type of decline disorders other than MSDS may be treated accordingly.