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Severe disease challenges faced in mango production

Mango is plagued by a number of diseases, only a few of which are serious enough to cause crop loss or even tree death due to infection. Mango is home to hundreds of pathogens, some of which are worldwide, some are localized, and others are only present on rare occasions. Some pathogens are seasonal, while others are active year-round, depending on the susceptible phenological stages and weather conditions. Climate change has accelerated the spread of new diseases while also reducing the severity of existing ones. The major disease challenges in mango production are described for the benefit of growers in the current mango production scenario.

DISEASES are one of the major challenges behind the low productivity of mango. Among a large number of diseases, wilt, decline, twig drying, dieback, blossom blight, powdery mildew, anthracnose and shoulder browning are of economic importance and are responsible for severe losses. In order to avoid significant economic losses, integrated disease management practices have been developed, refined and practiced. Recent trends in disease management have been based on awareness of toxic residues, export prospects and sustainability. The success of management strategy depends upon the knowledge of the causal agent, correct diagnosis and understanding of disease epidemiology, disease cycle and the critical level of infection for management actions. Major diseases of mango are described with necessary details.

Wilt and decline

The mango wilt and decline diseases are caused by the fungi, *Ceratocystis fimbriata* and *Berkeleyomyces basicola,* which are basically soil borne pathogens, but may be transmitted by planting material, wind, water, soil, human and beetles. The pathogens enter the host mostly through injured portions. Scolytid/ambrosia beetles (*Hypocryphalus mangifera* and *Xyleborus* spp.) are basically found in dead wood on mango trees and are attracted to *Ceratocystis* infected trees due to fruity odour of the fungus. They

Symptoms of wilt and decline (Fig. 1a. beetle infestation, b. wilt, c. decline, d. wood staining, e. gum oozing)

Symptoms of dieback and twig drying (Fig. 2a. dieback, b. twig drying)

produce large amounts of fine wood shavings when creating breeding galleries in the trunk and branches, which contain spores and fragments of mycelium. Uncontrolled irrigation, intercropping, tree wounding, and improper fertilizer application all contribute to mango tree wilt.The infection of *C. fimbriata* in the main trunk of trees causes sudden wilt symptoms but infection of either of the pathogens in the roots causes a decline. The internal symptoms develop as dark staining of infected wood followed by exudation of gum from the trunk and branches (Fig. 1a-e).

Management

- Avoid damage to the roots, minimum tillage should be adopted and deep ploughing should completely be avoided in mango orchards. Intercrops should always be grown beyond the canopy area, especially if they are grown in young orchards.
- Wilt affected and nearby trees should be treated with thiophanate methyl 70WP @ 50-150 g or hexaconozole 5 SC @ 50-150 ml per tree according to the age of the trees as a soil drench.
- Infected or wilted branches should be cut and cut ends should be pasted with Bordo Paste (1:1:10) or 5.0% solution of copper oxychloride.
- The aerial portion of trees should be sprayed with tetraconazole 3.8 EW propiconazole 25EC @ 0.1% at the appearance of the first symptom.
- If an infestation of Scolytid beetles is observed in an orchard, it should be managed by spray of Malathion 50 EC @ 0.2 to 0.3% on the trunk at a 15 day interval.
- Irrigation must be done by a drip system or by using channels to avoid disease dispersal through water from infected trees to healthy trees.

Dieback and twig drying

Dieback or drying of the plant from the top downwards or random drying of twigs is caused by a wound parasite, *Lasiodiplodia theobromae*. High summer temperatures predispose the trees to infection during the rainy season and symptoms appear after the rainy season. Relative humidity of more than 80%, temperatures ranging from 26 to 32°C, and rain all contribute to disease development. The disease is characterized by dying back of twigs from top downwards, followed by complete defoliation (Fig. 2a). External evidence of a disease is discoloration or darkening of the bark on young green twigs. The leaves lose their healthy green colour and gradually turn brown. Cracks may appear on branches, which exude gum before they die. Twig drying takes place randomly on a part or on the whole tree (Fig. 2b).

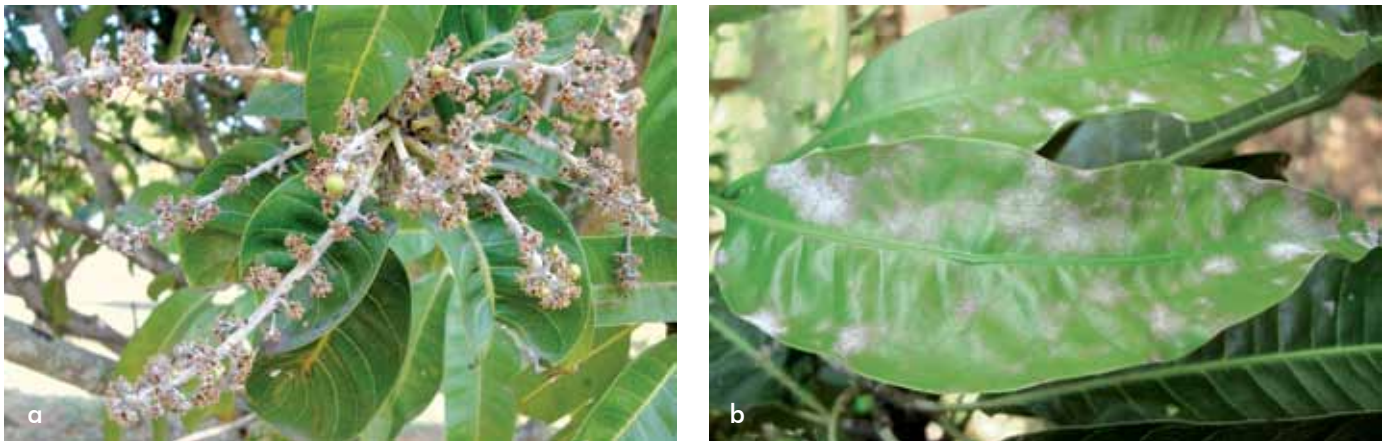
Management

Pruning of the diseased twigs 5-10 cm below the infection site followed by a spray of Bordeaux mixture (5:5:50) or copper oxychloride (0.3%) has been effective in managing the disease. However, extra care of trees for water and nutrition is necessary for better recovery.

Blossom blight

Blossom blight is a disease that affects plants all over the world and is caused by the fungi *Alternaria alternata* and *Colletotriculum gloeosporioides*. Blighted panicles may not bear fruit and, thus, the disease is of great economic significance. The symptoms appear during panicle development and flowering. The earliest recognizable symptoms of the disease are the production of blackish brown specks or spots on the peduncle and flowers (Fig. 3).

Fig. 3. Symptoms of blossom blight



Symptoms of powdery mildew (Fig. 4a. panicle, b. leaf)

Small black spots appear in the open flower panicle, which gradually enlarge and often coalesce to cause the death of flowers, either directly or indirectly by the drying up of the flower stalks. The infected flowers fall off, leaving the more persistent spikes on the peduncles. The severity of the disease may vary depending on the prevailing weather conditions. A positive correlation between the severity of the blossom blight and rainfall, rainy days and the vapour pressure deficit has been observed. In dry weather, disease do not cause significant losses.

Management

Management efforts should be based on weather prediction and the possibility of economic damage. Disease can be managed by a spray of carbendazim (12%) + mancozeb (63%) formulation @ 0.2%, azoxystrobin 23SC @ 0.1% or propineb 70WP @ 0.2%.

Powdery mildew

Powdery mildew, caused by the fungus, *Oidium mangiferae* is a widespread, devastating disease. Its severity mainly depends on weather conditions and susceptible crop stage and available inoculum load. The infection is caused by wind-borne conidia, and the life cycle is completed in 5-9 days. Spore release was positively correlated with temperature and negatively correlated with humidity, vapour pressure deficit and leaf wetness. Minimum temperatures of 10-13°C and maximum temperatures of 27-31°C, combined with high humidity, were found to be the most conducive to disease development. Whereas, temperatures below 27°C and above 35°C do not cause economically significant losses.

The characteristic symptom is the white superficial, powdery appearance of fungal growth on inflorescences, stalks of the inflorescences (Fig. 4a), leaves (Fig. 4b), and young fruits. The mildew attack on mango flowers results in the dropping of the infected flowers. Infected young fruits either drop or if they grow, their epidermis in the infected area cracks and a corky tissue is formed.

Management

Since, the incidence of disease is weather dependent, spraying should be done only after the assessment of the possibility of economically significant damage. Sulphur 80WDG 0.2% or hexaconazole 5SC @ 0.1% can be used to treat it.

Anthracnose

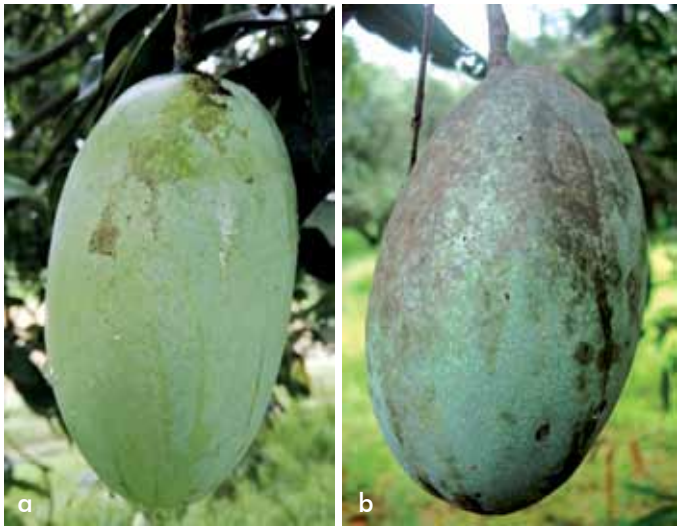
Anthracnose disease, caused by the fungus, *Colletotrichum gloeosporioides* is a destructive and widespread disease. The fungus infects the entire mango tree, causing symptoms such as leaf spots, twig blight, wither tip, blossom blight, and fruit rot. Anthracnose losses have been estimated to be between 2 and 39%. Numerous oval or irregular brown or deep brownish spots of variable size, round or angular in shape, scattered over the leaf surface, are the characteristic symptoms (Fig. 5a). The spot may begin randomly on any part or on the whole leaf. Under damp conditions, the spots grow rapidly, forming elongated brown necrotic areas, which later rupture and give the older leaves a shot hole appearance (Fig. 5b). Young leaves are more prone to attacks than old ones. White tip symptoms are caused by infection at the tip of very young branches. Small fruits are also affected under favourable weather conditions (Fig. 5c). The infection is favoured by high humidity at moderate temperatures

Symptoms of anthracnose (Fig. 5a. Initial, b. developed, c. infection of fruit-lets)

(25°C). Conidia were observed to germinate and form appressoria between 95 and 100% relative humidity.

Management

In order to avoid fresh infection, the sources of infection should be eliminated. Diseased twigs, leaves, and fruits that fall to the ground in the orchard should be collected, and severely infected twigs from the tree should be pruned and burnt, as the fungus has a long saprophytic survival ability on dead twigs. Plants may be sprayed with suitable fungicides like copper oxychloride 50WP @ 0.3%, propineeb 70WP @ 0.2%, carbendazim (12%) + mancozeb (63%) @ 0.2% or azoxystrobin 23SC @ 0.1% in places where the disease exists.



Symptoms of shoulder browning (Fig. 6a. Initial, b. developed)

Shoulder browning

Shoulder browning disease is caused by the complex of *Colletotrichum gloeosporioides*, *Alternaria alternata* and *Capnodium mangiferae* during the monsoon months. The incidence of the disease has been recorded at up to 100% with a severity of up to 71%. Rainfall plays a key role in the development of the disease. Apart from rainfall, temperature, relative humidity and wind speed were found to be responsible for disease dynamism. The symptoms appear as depositions on the fruit's shoulders (Fig. 6a). The deposit contains stains and spores of fungi existing on tree. The number and amount of rain gradually increases the deposition of spores and staining of the epicarp (Fig. 6b).

Management

Management of this disease is of great significance for the market value of fruits as well as for reducing the postharvest rotting of fruits. It can be controlled by bagging fruits, spraying with difenoconazole at a concentration of 0.05%, propineb 70WP at a concentration of 0.2%, or spraying oil at a concentration of 1.0%.

For further interaction, please write to:
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