Papaya Diseases and Disorders
by
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Papaya or pawpaw (*Carica* papaya) trees are subjected to a few diseases ranging from viral to bacterial and fungal. Papaya is often planted in the backyards in residential areas as well as on a commercial scale in huge orchards. Normally, in the backyard where only a few trees are planted, disease is not a real problem. However, in a high density planted area, diseases can pose some challenges to the grower. This article touches on some of the diseases. Some disorders are also discussed here as they can be mistaken as diseases.

Papaya ringspot virus

This viral disease is caused by the papaya ringspot virus –P strain. It is transmitted by the insect vectors belonging to the Aphididae, namely *Myzus persicae* and *Aphis gossypii.* It can also be transmitted through contaminated pruning or harvesting knives. This disease was found in Johore a few years ago and infected many papaya plantations. It was first reported in Hawaii and then in Florida, the Caribbean countries and Australia. It is present in a few Asian countries, including Thailand, Vietnam, the Philppines, India and Taiwan. Sarawak is still free from this disease.

The disease causes mottling and distortion of leaves. It produces ringspot symptoms on fruit (Figure 1), and water-soaked oily streaks on stems and petioles. Fruit production drops and the plants are stunted. In severe cases, the tree dies (Figure 2). Since there are no remedial measures for this disease, removal of the infected tree and vector control in the infected areas, as well as sterilizing pruning and harvesting knives, can prevent its spread within the orchard.

Bacterial dieback

This disease, caused by the bacteria, *Erwinia* spp. was described in the previous article and therefore will not be discussed here.

Phytophthora collar rot

This soil-borne fungus, *Phytophthora palmivora*, infects the collar of the papaya tree trunk at the soil level and the roots. The infected collar and roots turn brown and becomes soft (Figure 3). In a severe infection, the root and collar will rot. Under suitable wet conditions, a white fungus may be seen on the infected collar. The older leaves of the infected tree turn yellow and eventually drop, leaving only a few small leaves at the apex. The tree wilts and dies.

Planting the papaya seedling in an area not prone to waterlogging or planting on a mound can reduce the incidence of Phytophthora collar rot. The fungus can sometimes attack the fruit and removal of fallen infected fruit from the ground helps to remove one of the sources of infection. Improving the soil drainage in waterlogged areas can reduce the incidence of the disease. If detection of the disease is early, treatment of the collar and roots with the fungicide, propineb, can control the disease. However, in severe cases, fungicides are not effective.

Corynespora leaf spot
The fungus, *Corynespora cassiicola*, causes small yellow to light brown spots on the leaves (Figure 4). When the spot is fully developed, it has a brown centre with a yellow halo surrounding it. Elliptical lesions appear on the leaf petioles. The conidia (fungal spores) are dispersed by wind and wet humid conditions favour their growth. This fungus can be seed-borne and it can also survive on plant debris for up to 2 years. It can cause pre-mature defoliation and consequently reduce fruit yield.
In severe cases, spraying with the fungicides, mancozeb or maneb, can help to control the disease.

Cladosporium leaf spot
This disease is caused by the opportunistic fungus, *Cladosporium oxysporum*, in association with the insect, a thrip Feeding by thrips on the young leaves or shoots causes leaf distortion (Figure 5) and encourages the fungal infection. When the young leaves unfold, they are malformed with stringy mid-ribs crinkled leaf lamina. Yellow to brown spots appear on the leaf lamina, and develop into shot holes as the infection worsens.

Fruit anthracnose
This post-harvest disease occurs when the fruit ripens. Small water-soaked spots appear on the surface of the fruit (Figure 6). These brown to gray spots are depressed and enlarge rapidly as the fruit ripens to form sunken lesions, a characteristic of the disease. Surrounding the spot is a circular translucent margin. Sometimes, the spot is covered with masses of light orange to pink conidia.
To reduce the fungal inoculum in the papaya orchard, do not leave ripe fruit on the tree, and practice good farm hygiene by removing fallen fruit from the ground. For commercial fruit production, a post-harvest treatment using hot water treatment and chilling can delay the disease occurrence. For some export markets, dipping the fruit in a 0.05% a.i. (active ingredient) of the fungicide, prochloraz, is the practice to delay the onset of the disease.

Leaf yellowing due to waterlogging
Sometimes leaves of papaya trees turn yellow during the wet season (Figure 7). This is a common problem in low lying areas. Planting on a mound and improving soil drainage can prevent this problem.

Bumpy fruit
Occasionally, bumpy fruit is observed on the papaya tree (Figure 8). This is due to boron deficiency. Latex exudes from parts of the fruit. In severe cases, the tree may have a stunted bunchy appearance. The seeds are either aborted or poorly developed. Spraying the tree with 0.25% borax or a soil application of 0.5-1 gram of borax per tree can alleviate the problem.

Fruit carpellody (cat-face)
This fruit deformity that makes the fruit look like a cat's face (Figure 9) occurs on hermaphrodite plants of some genotypes when the plants are exposed to low night temperatures and high moisture and nitrogen levels. Under such conditions, the stamens become joined with the ovary and develop into carpel-like structures. This deformity makes the fruit unmarketable. To avoid this problem, do not use seeds from the affected tree to produce seedlings.

Figure1:
Papaya fruit with
ringspot virus symptoms

Figure 2:
Papaya trees in Taiwan
dying from papaya ringspot
virus infection

Figure 3:
Phytophthora collar rot

Figure 4:
Corynespora leaf spots
on papaya leaf

Figure 5:
Cladosporium-infected leaf

Figure 6:
Fruit anthracnose

Figure 7:
Leaf yellowing due to waterlogging

Figure 8:
Bumpy fruit

Figure 9: Fruit carpellody (cat face)