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Citrus Wither Tip

Symptoms:

- Dieback of young twigs occurs from tip to downward.
- Black dot like bodies are found on dead tissues.
- Fruits become infected during rainy spring and summer weather.
- Fungal spores drip onto fruits during wet weather.
- The fruit usually begins to rot after harvest.
- Dying leaves and twigs become covered with dark fungal spores by which the pathogen spreads.
- **C.O.** *Colletotrichum gloeosporioides*

Citrus Wither tip



Citrus Wither tip



Tear Stain Symptoms



Anthracnose symptoms on fallen fruit



Disease cycle

- The fungus is a common inhabitant of citrus rind and manifests itself when the rind is weakened.
- Spores of this fungus are produced in specialized structures or fruiting bodies called acervuli, which are formed on the surface of deadwood present in the tree canopy.
- Initial infection occurs from airborne spores that are produced on debris located in the soil.
- Fruit infections occur primarily from the localized dispersal of spores produced on the deadwood.

Epidemiology

- High humidity and 25°C temperature are favourable for the disease development.

Management

- Clipping of diseased branches with some healthy portion.
- Spray of Topsin-M @ 2 gm/litre of water.

Citrus Greening

Symptoms

- It invades conducting tissues and causes decline of citrus trees rendering them unproductive.
- **Leaf Symptoms**
- Leaves become smaller.
- Blotchy mottle pattern is evident.
- Chronically infected trees show yellowing of the entire canopy with sparse foliage and severe twig dieback.
- **Fruit Symptoms**
- Fruit are small, lopsided, tend to remain mostly green even when mature and are bitter.
- Seeds are aborted.
- Reduced fruit yield per tree and reduced life span of trees.
- ***C.O. Candidatus Liberibacter***

- ***Candidatus Liberibacter*** is a genus of gram-negative bacteria in the Rhizobiaceae family. The term *Candidatus* is used to indicate that it has not proved possible to maintain this bacterium in culture.
- Detection of the liberibacters is based on PCR amplification of their 16S rRNA gene with specific primers.
- Members of the genus are plant pathogens mostly transmitted by psyllids. The genus was originally spelled *Liberobacter*.

- Three strains of citrus greening bacteria can cause the disease:
- **The Asiatic form** (*Candidatus Liberibacter asiaticus*) is the most widespread.
- **African form** (*Candidatus Liberibacter africanus*) is present in Africa and the Middle East.
- **The American form** (*Candidatus Liberibacter americanus*) so far is found in Brazil.

Symptoms of Citrus Greening



Asymmetrical “Lopsided” Fruit





Epidemiology

- African form expresses symptoms in relatively cool conditions (20-25°C).
- Asian form shows symptoms in warm conditions (up to 35°C).
- American form is heat sensitive and does not grow above night / day temperature of 24/32°C.

Transmission

- Bacterial growth depends on nutrients from the plant phloem.
- *Candidatus liberibacter asiaticus* is transmitted through *Diaphorina citri*'s salivary glands.
- When it feeds on the plant, the saliva is delivered into the plant's phloem via its stylet.
- The infected citrus plant may transmit the bacteria to healthy psyllids when they feed on it.

Management

- Use disease free nursery stock.
- Good management practices should be adopted.
- Control of citrus psyllid.
- Removal of severely affected trees.
- Regulation of movement of propagating material.

Citrus Canker

- Citrus canker is a highly damaging disease of citrus crop.
- It decreases fruit quality and yield.
- **Symptoms**
- **Leaf Symptoms**
- Bright yellow spots on the underside of the leaf occur first followed by raised brownish lesions on both sides of the leaves.
- These then become rough, cracked and corky.
- The canker may be surrounded by a water-soaked yellow or chlorotic halo.

Fruit Symptoms

- Crater-like lesions form on the surface surrounded by water-soaked margin or yellow halo, which can expand to 10mm.
- They may be scattered or several lesions can occur together in an irregular pattern.
- In young fruit, an ooze of resinous substance may be observed.

Symptoms on Stem and Branches

- Lesions are light to dark brown, raised and corky, that eventually become dry and scabby.
- They can vary in size from 5 to 10 mm.
- The appearance of symptoms on stems often indicates infection for a long time.

Symptoms of Canker on Leaves



Symptoms of Canker on Fruit



Causal Organism

- *C. O. Xanthomonas axonopodis* pv. *citri*
- The bacterium *Xanthomonas axonopodis* pv. *citri* is a rod-shaped, gram-negative and has a single polar flagellum.
- Colonies on laboratory media are usually yellow due to 'xanthomonadin' pigment production.
- When glucose or other sugars are added to the culture medium, colonies become very mucoid due to the production of an exopolysaccharide slime.

Dispersal

- Bacteria can be dispersed over short distances through wind, rain splash and overhead irrigation.
- Long distance spread can occur through flooding and cyclones and human assisted movement of clothes, equipment and infected plant material (including bud wood, rootstock seedling, budded trees).
- The disease can be spread by birds, insects and humans, particularly when trees are wet.
- The bacteria can survive in diseased plant tissue as well as in soil. It can over-winter in angular shoots, and then become active again in the following season.

Disease Cycle

- Bacteria propagate in lesions in leaves, stems, and fruit. When there is free moisture on the lesions, the bacteria ooze out and can be dispersed to infect new growth.
- Plants are infected when bacteria enter wounds and natural openings on leaves, growing shoots and fruit.
- Wind-driven rain is the main dispersal agent and aids in the penetration of bacteria through the stomatal pores or wounds made by thorns, insects (leaf miner) and blowing sand.
- Pruning causes severe wounding and can lead to infection. Multiplication of bacteria occurs while the lesions are still expanding and numbers of bacteria produced per lesion is related to general host susceptibility.

Epidemiology

- Almost all infections occur on leaves and stems within the first 6 weeks after initiation of growth.
- Fruit can also act as an indicator of time of infection.
- The maximum and optimum temperature ranges for growth are to 39°C and 28 to 30°C, respectively.

Management

- **1. Exclusion:**
- Strict quarantine measures are required.
- **2. Sanitation:**
- New infections of citrus canker are linked to human and mechanical transmission.
- Humans can carry bacteria on their skin, clothing, gloves, hand tools, picking sacks, ladders, etc. Machinery and implements can become contaminated. So decontamination is necessarily required.
- **3. Chemical Spray:**
- Spray of copper hydroxide @ 2.5 gm/ liter of water.
or
- Spray of Bordeaux mixture
- 1:1.5:100 (CuSo₄= 01 Kg + Lime= 1.5 Kg + Water= 100 liter).

*Sources

- 1. Recommended books.
 - 2. Latest research articles downloaded from Google.
 - 3. Google images.
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- *Solely for academic purpose and guidance of students.