

Citrus canker

It originated in South China, Indonesia and India and is one of the most destructive citrus diseases. It causes huge losses in Asia, Africa, Australia and South America by reducing fruit quality and quantity, and, causing premature fruit drop.

Symptoms

- Leaves, twigs and fruits develop necrotic brown spots with a coarse surface which become hard & get raised on the infected host surface.
- Invasion of pathogen in the host takes places through the young tissues, stomata, wounds and in mature tissues, infection occurs through the wounds.
- The infected spots on the leaves are initially white and invisible with naked eye but after 7 days, spots become spongy and develop brown colour, and become hard. Margins of the lesions get raised on general surface of host tissue and give greasy appearance.
- Around mature advanced lesions yellow lesions develop. More or less similar lesions develop on twigs and fruits.
- The size of Lesions varies in different cultivars and on different plant parts.
- The lesions may enlarge rapidly and coalesce encircling the entire twig. The cankers become hard & raised on infected organs due to hypertrophy and limited hyperplastic activity in parenchymatous tissues.
- Thus, the mature canker has hypertrophied cells with a small number of hyperplastic cells along its margin.

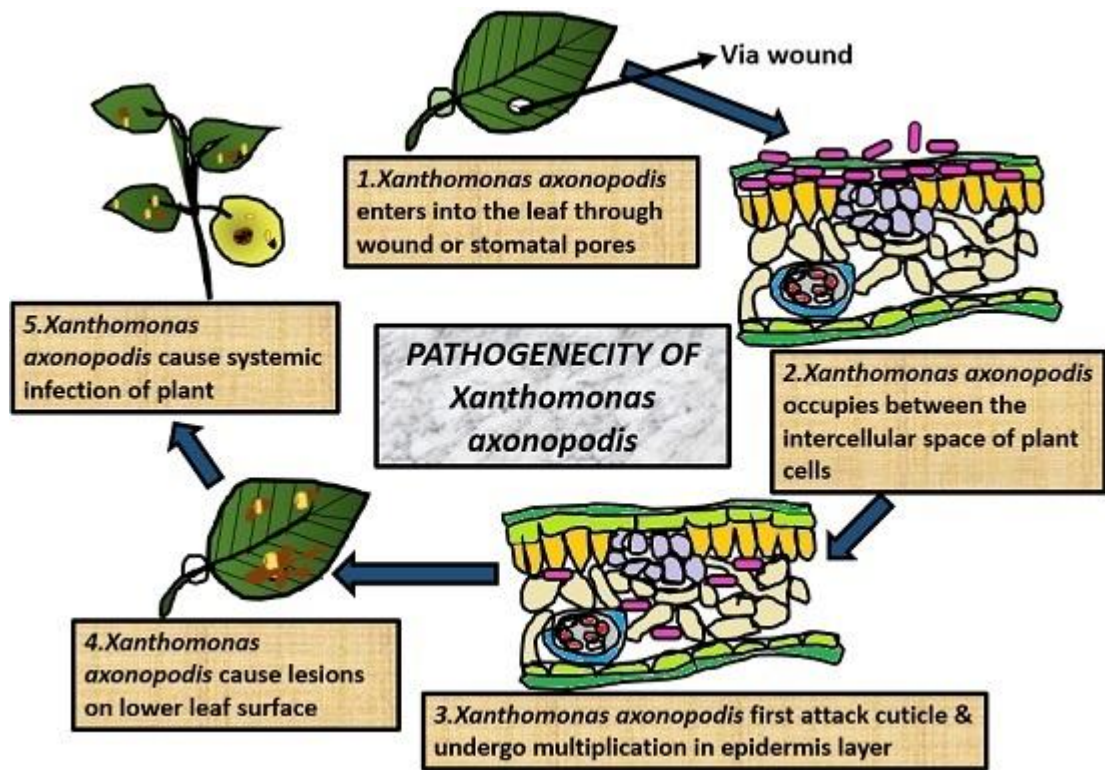


Causal organism

It is caused by *Xanthomonas axonopodis*, earlier known as *Xanthomonas citri*. It is gram negative, rod-shaped bacterium having a single polar flagellum. Bacterium is pathogenic and parasitic.

Disease cycle

- Citrus canker is a polycyclic bacterial disease. The *Xanthomonas axonopodis* pv. *citri* bacterium reproduces by binary fission in canker lesions in citrus leaves, stems and fruit.
- When moisture comes into contact with these lesions, the bacteria ooze out onto the surface of the plant tissues and can be dispersed by rain splash or wind-driven rain.
- The primary dispersal agent is wind-driven rain. Wind speeds must be at least 18 mph to create rainwater congestion of plant tissues, which helps the inoculum enter through the stomata.
- However, if there are wounds in the plant tissues (from thorns, pruning, other mechanical damage, etc.), the bacteria can inoculate plant tissues at much lower wind speeds. As few as 1 to 2 bacterial cells forced through stomatal openings or wounds can lead to infection and lesion formation, and the infection cycle begins again.
- The bacterium can survive in the margins of lesions on plant tissues until they fall and begin to decompose, at which point the bacteria face competition from saprophytic microorganisms in the soil (exposed bacteria can survive for only a few days in soil, and a few months in plant refuse incorporated into the soil).
- Exposure to direct sunlight accelerates the death of bacteria, and bacteria that oozes onto plant surfaces die when dried out. However, the canker bacteria can survive in lesions on woody tissue surfaces for years, and serve as inoculum across growing seasons.
- Although the dispersal of bacteria by normal wind-driven rain is generally limited to relatively short distances, extreme tropical weather has been demonstrated to disperse the pathogen many miles.
- In addition, long-distance movement of the pathogen can occur through human vectors (contamination of clothing, equipment, tools, etc.), and by the movement of diseased plant propagating material.



Disease Management

- Quarantine measures play great role in controlling this disease.
- The field sanitation involving burning of diseased plant debris is more important for the management of this disease.
- Canker free nursery stock should be used for raising new plants.
- Pruning of shoots bearing canker lesion is also effective in reducing the inoculum load with in a grove.
- Periodic sprays of insecticides like isoxathion (kar phos) is effective in control of insect damage to uphold leaves, which facilitated canker infection.
- Bordeaux mixture and antibiotic spray by streptomycin in (5.00 – 1000 ppm) have been effective.
- Spraying of neem cake of about 160 lb/ha has been found quite effective in control of this disease.

Please refer to the given link for additional information

<https://www.apsnet.org/edcenter/disandpath/prokaryote/pdlessons/Pages/CitrusCanker.aspx>

Angular leaf spot of cotton

The disease occurs in all cotton growing regions of the world, including USA, South America, India, Egypt and Sudan. In India, the disease was first observed in Tamil Nadu in 1918. Since then it has been found to occur in various degrees in all the major cotton growing areas of the country.

Symptoms

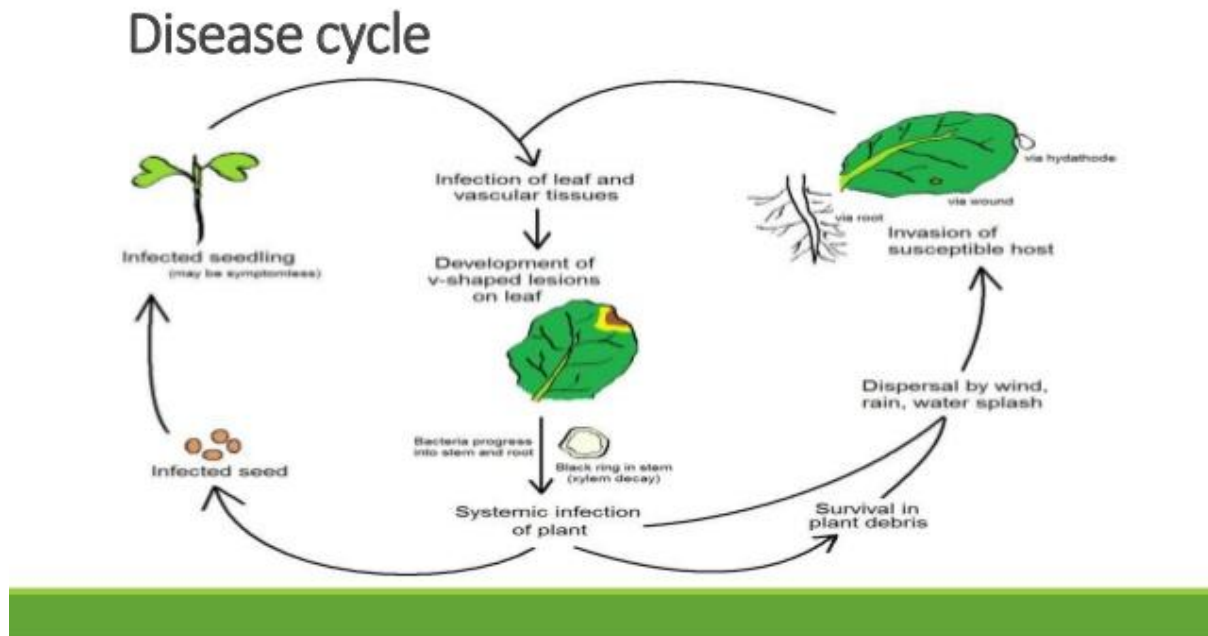
- The disease appears on different parts of cotton plant, both in seedling and mature plant stage.
- The disease first appears on leaves, which appear water soaked, turn black and dry up often leaving the young seedling green with a black tip. Most of such plants die.
- In less severely affected plants, points on leaves and stem become water soaked and enlarge into angular reddish spots about 1 mm in diameter.
- The spots often coalesce and the leaf gradually yellows and drops.
- Lesions on young stems sometimes cause girdling and referred to as black arm. In older stems the spots may be callused off and leave open cankers.
- Yellowish bacterial exudate is common on lesions, in moist weather.
- On bolls, water soaked lesions appear, which coalesce to form irregular, large, brown, sunken areas. Bolls infected when young, may drop prematurely. Older bolls when infected may become distorted and the lint may be discolored.



Causal organism: *Xanthomonas campestris* pv. *malvacearum*. It is an aerobic, gram negative bacterium.

Disease cycle

The pathogen is both externally as well as internally seed borne. The primary infection starts mainly in the seed where the bacterium may be present as a slimy mass on the fuzz or inside the seed. Infected leaves, twigs and cotton bolls that fall on the soil surface also form an important source for the carryover of the disease. The secondary spread of the pathogen occurs mainly through the agency of wind and rain water. Pathogen remains viable for 3-6 months on the surface of the soil and buried 15cm deep respectively. In the floods or if the crop is sown following trash application, the pathogen survives for less than one month. This disease frequently causes epidemics in north India.



Disease management

1. Field sanitation.
2. (a) Externally seed borne infection can be eradicated by delinting the seed with Conc. H_2SO_4 for 5 minutes, wash with lime solution to neutralise the effect and finally washing with running water to remove the residue and drying seeds.
(b) Internally seed borne infection can be eradicated by soaking seeds overnight in 100 ppm streptomycin sulphate or Agrimycin.
3. Secondary spread of the disease can be controlled by spraying the crop with streptomycin sulphate 100 ppm + Copper oxychloride (0.25%) at an interval of 15 days.
4. Certain fungicides e.g. carboxin, oxycarboxin and busan- 72 are also used to control this disease.
5. Hot water treatment of seeds at $56^{\circ}C$ for ten minutes eliminates both external and internal bacterial infection.

For additional information, please go through the provided link

<https://www.cottoninc.com/cotton-production/ag-research/plant-pathology/management-bacterial-blight-cotton/>