

Citrus Greening Disease and Its Management

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INTRODUCTION

Citrus is one of the most commercially important fruit crops around the world. India, with its ideal soil and prevailing climatic conditions has long since been considered as a major centre of origin and diversity for various Citrus spp. India is the fifth highest producer of Citrus in the world with annual production of 12.51 million tonnes. Citrus cultivation in India has been plagued by various diseases and pests which results in severe losses and causes a decline in the productivity of the fruit crop. Citrus greening disease is one of the most destructive citrus diseases and has caused losses amounting to billions of dollars around the world. Since the discovery of the disease, it has been called many names such as yellow branch disease or Citrus Huanglongbing (HLB). Citrus greening is caused by the vector-transmitted phloem-limited bacterium, belonging to the genus *Liberibacter*. Two geographically distinct *Candidatus* species, *Liberibacter Candidatus asiaticum* and *Liberibacter candidatus africanum*, are widely distributed in the citrus growing areas of the world. The strain, *Candidatus Liberibacter asiaticus* is mostly found in the Asian countries, India, Bangladesh, China, Pakistan, Bhutan, Indonesia, Japan, Malaysia, Nepal, Philippines, Saudi Arabia, Taiwan, Thailand, and Vietnam.

SYMPTOMS

The symptoms can be observed on different parts of the plant including the fruit and the leaves. In general, the greening-affected trees show stunted growth, twig dieback, sparse yellow foliage, yellowing of seedlings in severe cases and severe fruit drop. In some cases, green colour develops on fruit at the peduncular rather than the styler end, known as “colour inversion” or “red nose”. It also causes mottling and chlorosis of leaves. As a result of greening, the root systems remain poorly developed and start decaying from the rootlets. The affected trees bear fruits which are under-developed, lopsided and poorly coloured.

Grayish-white waxy marks appear on the rind surface when pressure is exerted with a finger. Citrus greening also leaves the trees more vulnerable to the attacks of citrus longhorned beetle and *Phytophthora* fungi.

TRANSMISSION

The disease is transmitted by the insect vector; *Diaphorina citri* Kuwayama or Citrus psylla. The fourth and fifth instar nymphs can acquire citrus greening bacteria and transmit the disease as nymphs or adults. The transmission of the pathogen occurs in a persistent manner where the bacteria multiplies inside the psyllids. The greening bacterium can be found in the haemolymph of the vectors. Once infected, the psyllids remain capable of transmitting HLB for their entire lives but progeny of infected psyllids are free of the bacterium. Citrus greening has also been reported to spread through graft transmission. Variability in graft transmission depends upon the plant part used for grafting, the amount of tissue used, and the pathogen isolate with single buds. The disease is also transmitted by Dodder (*Cuscuta* spp.)

MANAGEMENT

Different strategies that can be adopted for the effective management of greening disease are:

Protection of mother stock: Mother plants should be regularly checked for citrus greening and should be kept under isolation to prevent any contact with diseased plant and vectors.

Use of shoot tip grafted material

Thermotherapy: The graftwood is heated to 48–50°C for several minutes or alternatively,

saturated hot air treatment is given to the graftwood at 48–58°C.

Chemotherapy: Injection or treatment with antibiotics like application of Tetracycline hydrochloride to reduce leaf symptoms.

Eradication and replacement: Removal of abandoned and affected trees/ groves along with alternate hosts. Young trees (less than four-year old) and those not bearing fruits and showing symptoms should be eradicated and replaced, whereas trees with fruit should be pruned.

Control of vector: Use of natural enemies such as the parasite, *Tamarixia radiata* against the pest. Systemic pesticides like dimethoate and monocrotophos should be used for psyllid control on young non-producing trees and contact pesticides used on older trees.

CONCLUSION

Citrus greening is one of the major causes of citrus decline throughout the citrus growing areas of the world. Although management strategies exist, they basically consist of chemical application of insecticides and traditional heat-sensitive antibiotics, which are harmful for human as well as animal health. Despite extensive research, there are still no effective management tools to treat HLB-positive trees or to prevent new infections. Given the far reaching disastrous effects of greening disease, innovative and preventive strategies to combat the citrus greening disease are urgently needed to ensure the survival of the citrus industry.