

Fusarium wilt disease of Angsana

The Fusarium wilt disease of Angsana was first recorded in Malacca around 1875, then 100 trees in Penang, followed by epidemics in avenues of trees at Tapah, Kuala Kubu, Kuala Lumpur and Taiping. Then in 1914 the disease first appeared in Singapore along the waterfront of Pulau Brani, then on Connaught Drive and in the grounds of the Istana near Orchard Road. In 1919 the disease again appeared in the Tanglin Barracks where four months later all the trees were chopped down to prevent any further spread of the disease.



Each of these outbreaks destroyed avenues of mature trees, occurred only every 5 to 10 years and were situated many kilometres apart.

It was over 100 years before the cause of the disease was identified as the fungus *Fusarium oxysporum*, and a further 10 years before the disease cycle could be unraveled.

Propagation

Although Angsana can be propagated by seed, this is rarely used because of the ease of establishing plants by vegetative propagation. During the early years of the Republic many 100s of kilometres of roads were constructed and many of these were planted with “instant” trees of Angsana. Rooted poles, 1.5 m in length and between 4 – 5 cm in diameter.

Susceptibility of Angsana

Inoculating roots with cultures of *F. oxysporum* in 1991 quickly demonstrated the identity of the causal fungus and the susceptibility of Angsana. What was later learnt, however, was that many of the plants of Angsana are resistant, a fact that was exploited later in our research.



Fusarium oxysporum

This fungus is part of the natural population of soil borne organisms. It therefore relies on the movement of water or soil for mobility.

F. oxysporum is responsible for over 30 plant diseases with a specific form being aggressive on each host.



Lightning

It is lightning which triggers the epidemic. The aromatics released by the burnt bark and sap rapidly attracts insects.

Ambrosia beetles

The ambrosia beetle is a tiny tree boring beetle that cultivates fungi as a food source for the young larvae. If the fungus being carried is an aggressive form of *F. oxysporum* and the tree is susceptible, then infection takes place and tree will wilt and die.



Control

The control strategy is aimed at breaking the disease cycle by controlling the ambrosia beetles and thus preventing *F. oxysporum* from infecting the lightning damaged Angsana and becoming established in the soil.

The steps involved in the strategy are:

- (1) **Monitoring.** The success or failure of the control strategy depends on the efficiency of the monitoring team in detecting lightning damaged Angsana early and to co-ordinate the treatment programme.



(2) Removal of lightning damaged Angsana.

Insecticide sprays need to be applied to damage Angsana within days of 1st symptoms of wilting being noted to prevent the colonization by ambrosia beetles. The lightning damaged Angsana and as much of the root system as possible to be removed within 3 weeks of lightning strike.

(3) Trenching. Where possible trenching should be carried out between lightning damaged and undamaged Angsana to minimize the likelihood of tree-to-tree spread via root contact.

(4) Hygiene. All tools that are used on or around infected Angsana should be treated with 95% alcohol. Felled Angsana should be buried to rid them as sources of ambrosia beetle dispersal and sources of inoculum.

(5) Replanting with resistant Angsana varieties. If lightning damaged Angsana are removed before infection becomes established, replacement planting can be any other Angsana. However, once infection is established in the lightning damaged Angsana, it must be assumed that the fungal pathogen has reached the soil and resistant Angsana varieties have to be used for replacement planting.

(6) Angsana outside the jurisdiction of Government Departments. Owner of private properties should be advised that diseased Angsana are not only physical danger to properties, but also health hazard to surrounding susceptible Angsana. Therefore, it is important that diseased Angsana should be rapidly removed. NOTE: It would be most frustrating to see the control efforts by Government





Departments wasted because of one or two small hot spots of infection remaining within private properties. Hot spots act as sources of infection for subsequent outbreaks of the disease.

Resistance

Seed was collected from six hundred and ten trees and hardwood cuttings from 188 trees. Collection were from Myanmar in the north west to the Solomon Islands in the south east. Plants were then screened for resistance to *F. Oxysporum* on three occasions. The resulting one thousand three hundred young plant were then grown on and of these 160 were planted along roadsides and 64 in parkland saturations.



These plants are now ready for the final stage of the program, selection, multiplication and release for planting around Singapore.

When every Angsana planted in Singapore is from a resistant line, then we have taken a major step in controlling this disease.



Healthy tree → Lightning Strike → Ambrosia beetles introduce *F. oxysporum* → *F. oxysporum* invades vascular tissue → Tree dies