

Stubborn disease of citrus

What is it?

Stubborn is a serious bacterial disease of citrus trees, spread by leafhoppers. This disease is not present in Australia. Bringing infected material into Australia could introduce the disease.

Primary hosts

Citrus is the main economic host of stubborn. Most species and cultivars are affected, some symptomlessly, with oranges, lemons, mandarins, and grapefruit being particularly susceptible. Symptomless infection can also occur in a range of other plant species including weeds.

Non-citrus hosts include *Fortunella* species (kumquats), *Armoracia rusticana* (horseradish), *Barbarea vulgaris*, *Brassica geniculata*, *B. kaber*, *B. nigra* (black mustard), *B. oleracea* var. *botrytis*, *B. oleracea* var. *capitata*, *B. oleracea* var. *gemmifera*, *B. rapa* (turnip), *B. tournefortii*, *Capsella bursa-pastoris* (shepherd's purse), *Catharanthus roseus* (pink periwinkle), *Cynodon dactylon* (Bermuda grass), *Digitalis purpurea* (foxglove), *Oryza sativa* (rice), *Plantago ovata*, *Prunus avium* (cherry), *P. persica* (peach), *Pyrus communis* (pear), *Raphanus raphanistrum* (wild radish), *R. sativus* (radish), *Sedum praealtum*, *Sesamum indicum* (sesame), *Sisymbrium irio* (London rocket), *S. orientale*, *Sorghum halepense* (Johnson grass), *Tagetes erecta* (African marigold), *Viola cornuta* (horned violet), and *Zinnia elegans* (Zinnia).



Fruit affected by stubborn disease of citrus

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Young trees infected with stubborn disease

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Infected mature fruit (foreground) remain green, colour unevenly and remain smaller than normal

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Fruit produced by tree infected with Stubborn disease remain small and lopsided

Where does it occur?

Stubborn is important in several hot and arid citrus-growing areas overseas. This disease occurs in a number of countries around the Mediterranean basin and the Middle East, as well as in parts of the US and northern Africa. Stubborn may also be present in South America.

Infection and spread

Stubborn can be spread by infected budwood, and by leafhoppers. The main leafhopper vectors have not been reported in Australia but other species here may transmit the disease. The spread of stubborn is aided by the slow development of symptoms, the range of hosts available, and the long survival of infected trees.

Symptoms

Infected trees can show varying degrees of stunting. Leaves are typically shorter and broader than usual, sit abnormally upright, are cupped, and may sometimes be mottled or chlorotic (yellowed) as well. Some leaves may display misshaped, blunted or heart-shaped yellow tips, particularly in hot conditions. Shoots can be abnormally bunched and witches' brooms may occur due to the development of multiple axillary buds. Infected trees may also flower out of season and carry fruit at all stages of development.

Fruiting is typically suppressed by infection and fruits may be stunted, lopsided or acorn shaped due to a thicker rind at the base and thinner rind at the tip. Fruit can also show colour inversion, where the stem end discolours whilst the other end remains green. Seeds may be partially aborted.

Symptoms of this disease are persistent, remaining even when the tree is top-worked with healthy budwood, hence the name "stubborn". Although some of the symptoms of stubborn are quite characteristic, they are not always expressed. Some hosts remain symptomless, whereas others may only show mild stunting and deformation of the foliage. Non-citrus hosts can show symptoms of stunting and deformity, and may die off at higher temperatures.

Biosecurity measures

Quarantine is the best way to prevent this disease from entering Australia. The biggest threat is of people smuggling infected planting material into the country. Bringing citrus into Australia illegally places the whole industry at risk.

How can I protect my orchard from Stubborn disease?

Check your orchard frequently for the presence of new pests and unusual symptoms. Make sure you are familiar with common citrus pests so you can tell if you see something different.

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881.

EXOTIC PLANT PEST HOTLINE
1800 084 881

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Want more info?

If you would like more information, or to download a copy of the Industry Biosecurity Plan for the Citrus Industry, visit www.planthealthaustralia.com.au, email admin@phau.com.au or phone (02) 6215 7700.