Candidatus Phytoplasma



Fig. 1. *Candidatus* Phytoplasma australiense in *Paulownia* trees; typcial stunting of tree growth (a); interveinal chlorosis on leaves (b); and witches' brooms evident during winter months (c). Photo credits K. Bayliss.

Common Name: Phytoplasma
Disease: Witches' Broom, Big Bud, Little Leaf, Yellows
Classification: Bacteria; Firmicutes; Mollicutes; Acholeplasmatales; Acholeplasmataceae

Organisms belonging to the genus *Candidatus* (*Ca*.) Phytoplasma are prokaryotes lacking a rigid cell wall, that cannot be grown *in vitro*. They exist within the phloem sieve elements of their plant hosts as well as in the gut, salivary glands and haemolymph of sap-sucking insect vectors. Phytoplasmas, previously referred to as mycoplasma-like organisms (MLOs), are associated with many different agricultural and crop species in additional to ornamentals, timber trees and weed species, across Australia. The two most common strains in Australia are *Ca.* Phytoplasma australiense, associated with Australian grapevine yellows, and *Ca*. Phytoplasma aurantifolia, associated with tomato big bud.

Host Range:

Ca. Phytoplasma has been recorded as being associated with over 1000 different plant species, with the number of records increasing.

Impact:

The impact of phytoplasma infection on a host depends on the strain of the phytoplasma and the host it is infecting. Severe losses (up to 100%) have been recorded in some crops such as papaya. Strains causing diseases such as European stonefruit yellows or peach X disease are classified as emergency plant pests for Australia and potential host species are restricted by quarantine.

Diagnostics:

The most reliable method for detection of phytoplasmas is by PCR. Primers are used to amplify the 16S rRNA region which can then be sequenced and compared to known phytoplasma sequences. However, this method is not 100% reliable as detection also depends on the titre (level) within the plant, in addition to the plant tissues sampled and the season of sampling.

Key Distinguishing Features:

Symptoms vary depending on the strain of phytoplasma, season and host. Typical symptoms include stunting, virescence, phyllody and yellowing, however they may also resemble nutrient deficiencies or toxicities, herbicide damage and other biotic or abiotic stresses. Plants may also be asymptomatic, which raises issues when moving plant material between states or countries.

Control:

While tetracycline antibiotics are effective against phytoplasmas *in vitro*, there is no broad-scale chemical control. Since the disease is vectored by sap-sucking insects, the most effective method to control its spread is management - including the removal of infected hosts, and spraying with systemic insecticides to control vector populations.

Further Reading:

Streten, Gibb (2006) *Australasian Plant Pathology* **35**, 129--146.
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