

Rhizobium radiobacter

This bacterium can cause Crown Gall Disease in a wide variety of plant species



Pathogen Description

Rhizobium radiobacter is a soil-living, gram-negative, motile rod-shaped bacterium. It is a biotrophic pathogen that can alter the physiology and morphology of its host plant without killing it, resulting in tumour-like structures or galls.

Prior to 2001, gall forming *R. radiobacter* was called *Agrobacterium tumefaciens*.

Mode of Infection

Wounded plant tissue is known to 'attract' the bacteria. They move towards the plant tissue using chemical signals and colonise a plant's intercellular spaces. T-DNA from the bacterium is transferred into the cytoplasm and subsequently into the nucleus, stably integrating into the plant cell genome. The expression of T-DNA genes, leads to the production of bacterial proteins that promote tumour-formation in host tissues.

Symptoms

Only those strains of *R. radiobacter* containing Ti (tumour inducing) plasmids can cause galls. Galls are usually found at the base of the trunk and roots of trees, grapevines and woody plants.

Disease Spread

The secondary metabolism of the host is also 'hijacked' leading to the production of lots of abnormal cells. Water and nutrient movement is often affected with diseased plants showing weaker growth and poor yield.

Control

Crown Gall is difficult to control due to a lack of effective chemical treatments against the bacterium. Virulent (aggressive) strains have found ways to manipulate natural plant defences. The most effective control is achieved through good plant hygiene. Biological control with genetically transformed strains of *R. radiobacter* is available and effective against nopaline-producing Ti plasmids. Differential susceptibility to crown gall has been reported in cultivars of grape and raspberry.

Detection

Crown Galls are distinctive in appearance but plant health regimes rely upon being able to detect pathogens in the absence of symptoms and so DNA-based markers have been developed. These can also distinguish between other *Rhizobium* species.

Interesting Facts

This bacterium has possibly the broadest host range of any plant pathogenic bacterium, however, it causes significant financial losses in just a few horticultural species such as perennial fruits, nut, ornamental and vine crops.

In the 1970's it was discovered that cells of the bacterium were being transferred and integrated into the host genome paving the way for major advances in science over subsequent decades.

Further Reading

Extended description: <https://tinyurl.com/groad5o>