Rhizoctonia a disease menace for many crops

Rhizoctonia root rot of wheat is caused by the fungus, *Rhizoctonia solani*, and is a major disease of wheat crops across southern Australia — causing an estimated $77 million each year in lost production. This article details how Rhizoctonia operates in farming systems and the management tools that can be used to control the fungus.

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Rhizoctonia fungi have a wide-ranging geographical spread from the subarctic through to the tropics. As a pathogen, Rhizoctonia affects all known crop, tree, pasture and horticultural species.

The name Rhizoctonia refers to a group of fungal species which includes pathogens, saprophytes (able to survive in the absence of a host) and mycorrhizal fungi.

Rhizoctonia solani causes Rhizoctonia bare patch and is an extremely well adapted and competitive pathogen capable of surviving under extreme conditions and in the absence of a host.

The fungus survives in the soil either as melanised (hardened) hyphae in particulate organic matter or as sclerotia — thick-walled fungal hyphae capable of surviving extended periods in dry soil and which are not affected by tillage.

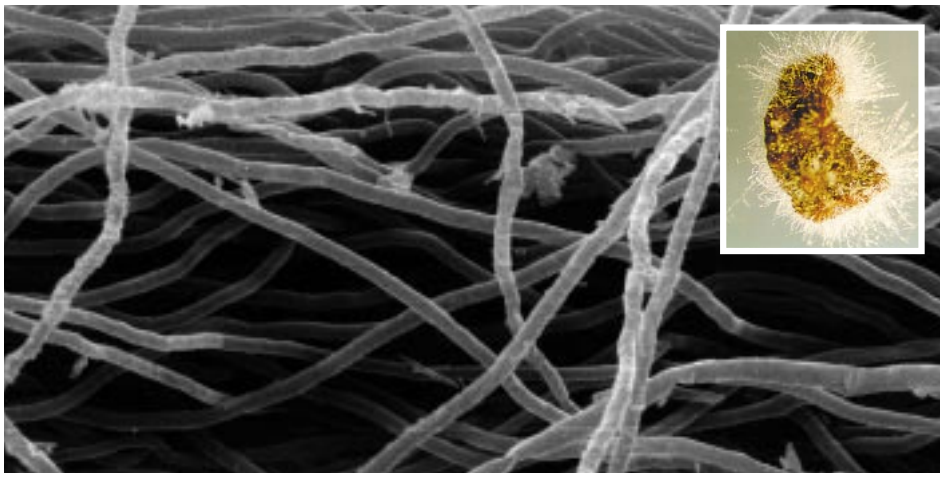
R. solani can be divided into several groups known as 'anastamosis' (AG) groups. Collectively these groups cause disease in a vast range of plant species including cereals and grasses (AG8), maize (AG2), legumes, oil seeds and potato (AG3) and other vegetable crops. Because of the pathogen's wide host range, crop rotation is not an effective control strategy.

Chemical and bio-control options are not always effective against *R. solani*.

At a glance

- *Rhizoctonia solani* is a pathogenic fungus which causes root rot symptoms in a wide range of crops.
- There are few control methods for Rhizoctonia as its host range is so wide that crop rotation cannot thwart the fungus.
- Rhizoctonia can survive in the soil in the absence of a host crop.
- Creating a microbially-rich, disease-suppressive soil through increasing carbon inputs and carbon turnover can reduce the incidence of Rhizoctonia root rot.

Photos: CSIRO Land and Water. Inset: S. Kumar, UWA.



Actively growing hyphae of Rhizoctonia solani *on wheat stubble.* Rhizoctonia solani *causes millions of dollars damage to wheat crops each year. Inset: Mature sclerotia of* Rhizoctonia solani *AG11 extracted from the soil around the roots of a lupin seedling. Rhizoctonia AG11 causes serious damping-off of narrow-leafed lupin in the northern grain belt of Western Australia. The sclerotia are hardened fungal hyphae, capable of surviving extended periods of dry, hot soil conditions.*

Cultivation

Cultivation reduces *R. solani* by breaking up the fungal hyphae network.

An exception is Rhizoctonia AG11 which attacks lupin and is a prolific producer of sclerotia.

Lack of cultivation in reduced tillage systems is thought to be the main reason Rhizoctonia disease increases in the early stages of these systems.

But long-term reduced tillage systems which retain stubble, and increase carbon inputs, often display a decline in Rhizoctonia root rot with time due to an increased population of disease-suppressive soil microbes.

Disease suppression

Creating a disease-suppressive, microbially-rich soil is an effective way to control Rhizoctonia root rot in grain and pasture crops.

Disease suppression can be promoted through stubble retention and intensive cropping, which result in an increase in the amount of biologically available soil carbon.

Over time, the elevated levels of biological activity cause a population change and stimulate the growth of disease-suppressive micro-organisms in the soil.

Disease suppression is regulated by the amount of available nitrogen in the soil and care needs to be taken to avoid a build-up of soil nitrogen during the summer and early autumn as this can reduce the ability of the microbial population to suppress Rhizoctonia.

Soil nitrogen can build up if carbon inputs are removed in the form of stubbles.

Spraying out crops to control resistant weeds will increase the amount of soil nitrogen and carbon. In addition legume pastures, green manures and moist, warm conditions favouring nitrogen mineralisation can lift soil nitrogen levels.

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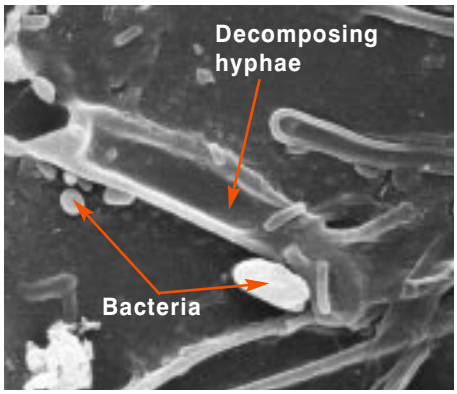

Rhizoctonia solani *hyphae with broken cell walls and bacterial colonisation of decomposing hyphae. Protozoan predators damage the fungal hyphae enabling bacteria to decompose them. Together bacteria and protozoa help suppress the disease.*

Next issue

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