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RHIZOCTONIA SOLANI ANASTOMOSIS GROUPS AND THEIR HOSTS

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WHAT IS RHIZOCTONIA?

The fungal plant pathogen *Rhizoctonia solani* is comprised of many species and strains. Those causing many important diseases on vegetable crops are called the *Thanatephorus cucumeris* species complex. These fungi are related to mushrooms and toadstools (Basidiomycetes) and have several nuclei in each of their cells (multinucleate). They generally cause damping-off, root and stem rots, and sometimes (under damp or humid conditions) leaf blighting or leaf spots.

HOW DOES RHIZOCTONIA SURVIVE, SPREAD AND INFECT PLANTS?

Most strains of *R. solani* don't produce spores on infected tissue but form resting bodies called sclerotia. These can survive in soils without a crop. Some strains produce sexual spores under certain environmental conditions. For example, air-borne spores (basidiospores) can form on a white mat of fungal growth at the base of potato stems or on the soil surface. Sclerotia or hyphal strands embedded in fragments of plant tissue can be spread by wind and water as well as on machinery, clothing and footwear.

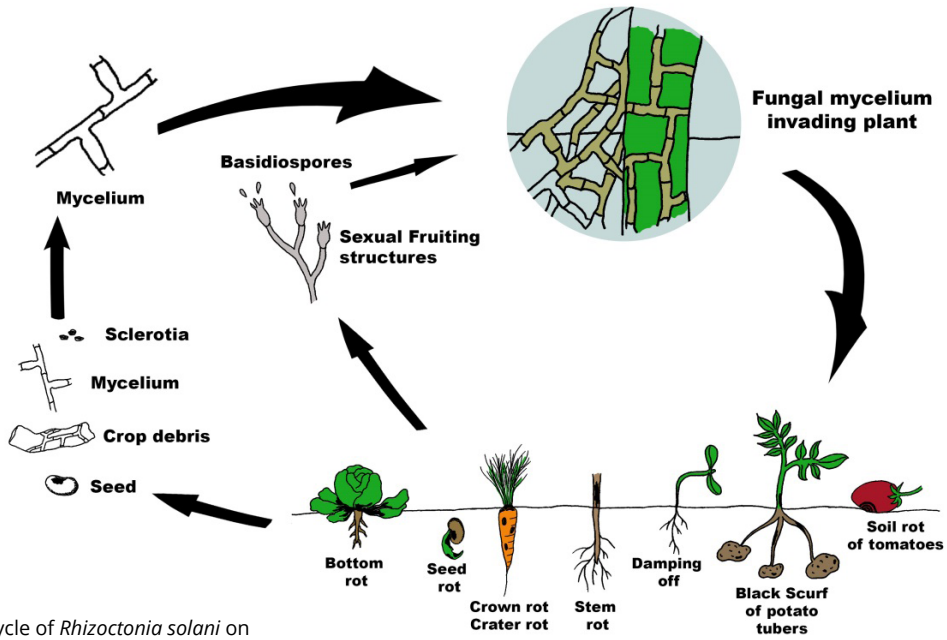

Figure1. Life cycle of *Rhizoctonia solani* on vegetable crops

Hort Innovation

This project has been funded by Hort Innovation using the vegetable and potato research and development levies and contributions from the Australian Government. Hort Innovation is the grower owned, not-for-profit research and development corporation for Australian horticulture.

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RHIZOCTONIA SOLANI ANASTOMOSIS GROUPS AND THEIR HOSTS

Fungal strands (hyphae) grow on or near the soil surface and when they encounter plant tissue they grow across the surface before infecting the outer layers of plant tissue (the cortex). A mass of branching, thread-like hyphae is called mycelium. *R. solani* hyphae release toxins that kill plant cells as they invade them. The *R. solani* life cycle is shown in Figure 1.

WHAT ARE ANASTOMOSIS GROUPS AND WHY ARE THEY IMPORTANT?

R. solani isolates are mostly characterised by the appearance of their hyphal strands, their branching features on culture media and their sclerotia (resting bodies). Plant pathologists have divided strains of *R. solani* based on the ability of different strains to fuse their hyphae together. Strains that could fuse (combining their genetic nuclei) were classified as anastomosis groups (AGs), which was considered to indicate close genetic relatedness.

Now that rapid DNA sequencing is available, these AGs can be further subdivided based on both their cultural features and DNA sequencing.

Commercial soil DNA tests are now available which report the population density of different *R. solani* AGs, for example SARDI Predicta tests. This DNA knowledge has helped to distinguish the different *R. solani* anastomosis groups and correlate them with their known hosts and geographical distribution.

Knowing which AG group(s) of *R. solani* is/are present in a field can be useful to plan crop rotations or choose a cover crop (Table 1). For example, while some cover crops may host *R. solani*, it is important to check if these are the AGs that have the potential to cause disease in the planned vegetable crop. Cereal cover crops will typically be affected by AG8, which doesn't affect many vegetable crops. In contrast AG2-1 infects brassicas, which if used as a cover crop may increase disease incidence in the following lettuce, potato or pea crop.

Weed management, crop residues, farm biosecurity and other cultural practices can also affect soil levels of *R. solani* and potential disease incidence.

Overseas research has demonstrated that certain *R. solani* AGs have differential sensitivities to some fungicides. Unfortunately, in Australia we know little about any differential responses of AGs to agrichemicals or to the array of microbial biocontrol options.

GROUP	SUB-GROUP	HOSTS
AG1	AG1-1A	Corn, beans, soybeans, rice
	AG1-1B	Lettuce, beans, beet
	AG1-1C	Broccoli, beet, radish, lettuce
AG2	AG2-1	Brassicas, canola, lettuce, potato, peas
	AG2-2 IIIB	Broccoli, corn, spinach
	AG2-2 IV	Broccoli, beet
AG3		Solanaceae, lettuce
AG4	AG4 HG-I	Tomato, melons, spinach, peanuts, cotton, tobacco
	AG4 HG-II	Brassicas, beet, lucerne, cotton
	AG4 HG-III	Brassicas, spinach, beet, cotton, strawberry
AG5		Corn, beet, soybean
AG6		Cotton, wheat
AG7		Radish, cotton
AG8		Oats, barley, wheat
AG9		Brassicas, potato
AG10		Barley, lettuce
AG11		Clover, lupins, wheat, potato, corn, soybean, rice, lily
AG12		Greenhood orchid
AG13		Corn, cotton

Table 1. Anastomosis Groups and known hosts of *Rhizoctonia solani* (*Thanatephorus cucumeris* species complex)

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