TEMPORAL DYNAMICS OF *RHIZOCTONIA SOLANI* AG8 INOCULUM IN AUSTRALIAN SOILS

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INTRODUCTION

Rhizoctonia bare patch is a disease of seedlings caused by *Rhizoctonia solani* Kühn AG-8. Recent surveys indicate that it causes significant losses in cereals, $59 million pa, mainly in low to medium rainfall regions across southern Australia (1). While previous research has found the risk of yield loss can be reduced by management practices that increase seedling vigour, it remains a difficult disease to predict and control.

The incidence of Rhizoctonia bare patch has increased in recent years due to a significant increase in intensive cereals, reduced tillage and the higher frequency of drought years, particularly below average spring and summer rainfall. This has resulted in higher inoculum levels recorded in PredictaB® tests prior to sowing during 2009.

R. solani fungus grows on soil organic matter and produces a hyphal network in the surface soil (2). Disease severity depends on the amount of Rhizoctonia inoculum, composition and activity of the soil biology community, available soil N levels over summer and at seeding and constraints to root growth (3). These complex relationships make it difficult to predict and manage this disease.

As part of a GRDC funded project we investigated the changes in inoculum, especially over summer, as influenced by environmental factors and soil biological activity under different rotation and tillage systems.

MATERIALS AND METHODS

During the 2008 off-season, surface soil (0-10cm) samples were collected from selected crop rotation and tillage treatments in field experiments at Waikerie (Alfisol) and Streaky Bay (Calcarosol) in SA and Galong (Red Brown Earth) in NSW. Samples were collected at monthly intervals after crop harvest in 2008 until sowing in 2009. Soils were analysed for *R. solani* AG8 DNA concentration (SARDI, RDTS), microbial activity, dissolved organic C and mineral N levels.

RESULTS and DISCUSSION

R. solani DNA levels at the start of 2008 crop season were 300, 160 and 100 pg / g soil at Waikerie, Streaky Bay and Galong sites, respectively. Changes in *R. solani* AG8 inoculum were observed both during the crop season and off-season at all the three experimental sites.

Tables 1. Changes in the concentration of *R. solani* AG8 DNA (pg / g soil) in soils following rotational crops.

Rotation	Tillage	Waikerie, SA		Streaky Bay, SA		Galong, NSW	
		Harvest 08	Sowing 09	Harvest 08	Sowing 09	Harvest 08	Sowing 09
Continuous Cereal	no-till	1047a	597a	668a	175a	244a	34a
Continuous Cereal	cultivated	865a	448a	349b	88b	100b	34a
Fallow-Wheat	no-till	407b	182b	28c	10b	ND	ND
Canola-Wheat	no-till	93c	50c	21c	32b	108b	25a
Pasture-Wheat	no-till	336b	179b	21c	17b	ND	ND

NB: Values within a column followed by the same letter are not significantly different at $P<0.05$.

Inoculum levels were highest after wheat and lowest after canola (Table 1). R. solani DNA concentrations generally decreased during summer in all the treatments and at all the three sites (Table 1 and Figure 1). In the continuous wheat, the average decline was lowest at Waikerie (45%) compared with 70% reduction at Streaky Bay and Galong. Soils with higher activities of cell-wall degrading enzymes and general microbial activity (e.g. Galong and Streaky Bay) showed greater decline in Rhizoctonia DNA over summer (data not shown). In addition, summer rainfall was highest at the Galong site and lowest at the Waikerie site. Cultivation reduced inoculum but the impact was lower at Waikerie compared to that in the other two experiments.

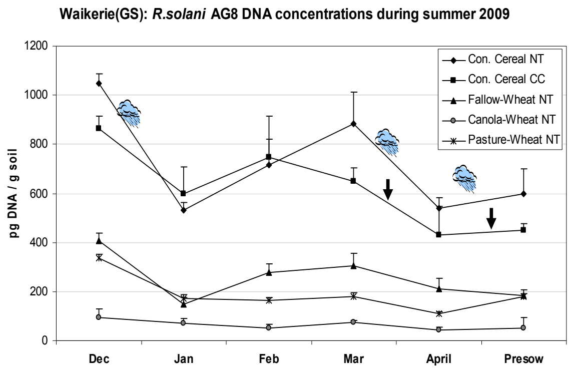

Figure 1. Changes in amount of *R. solani* AG8 DNA during summer months as affected by crop rotation and tillage at Waikerie, SA. Arrows represent cultivation and clouds indicate rainfall events.

In the absence of host plants, summer rainfall events >50mm in a week reduced Rhizoctonia DNA level, whereas it increased during prolonged dry periods, e.g. at the Waikerie site during January to March (Figure 1). Changes during the summer after the rotational crops were less dramatic than after wheat. Soil microbial activity during summer was higher after canola compared to other rotations (data not shown).

CONCLUSIONS

Non-cereal crop rotations can substantially reduce *R. solani* inoculum compared to wheat. Multiple rainfall events during summer can reduce inoculum levels from high to low disease risk. This has important implications in relation to timing of soil sampling during off-season and interpretation of DNA assessments.

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Cover photograph
Pythium myriotylum causing rhizome rot of ginger at Eumundi, about 20 km from the conference venue