Profitable break crops for management of root lesion nematodes (RLN) and *Rhizoctonia solani* AG8

B Swift, A Butler, S Collins, C Wilkinson, S Kelly, D Huberli, V Stewart, J Lemon, P Mattingley, A Loi, M D’Antuono, A van Burgel, DPIRD; G Knell, ConsultAg
"Excuse me, sir, would you mind getting the door for us?"
Three major soil diseases of cereals in the Western Region

*Rhizoctonia solani* (AG8)

Root Lesion Nematodes (RLN)

Crown rot
Biology and impact of root lesion nematodes

- Microscopic translucent ‘roundworm’
- The two major WA RLN are *Pratylenchus neglectus* and *P. quasitereoides*
- Become active after rain and invade roots
- Average yield loss is 270 kg/ha for every 10 RLN/g soil

Collins et al. 2018
Root lesion nematode symptoms

Photo: DPIRD
**P. neglectus** response to crop rotation options – glasshouse trials 2017 (Collins et al. 2018)

**Serradella is the clear winner!**

- R
- S

**Varieties:**
- Cadiz
- Santorini
- Margurita
- Jenabillup
- Casbah
- Sothis
- Dalkeith
- Yenda
- Bartolo
- Cavalier
- Kaspa
- La trobe
- Parada
- Rasina
- Mace
- Stingray
- Popany
- Nitro Plus
- Calingiri
- Prima

**Colors:**
- **Serradella**
- **biserrulla**
- **lupin**
- **sub-clover**
- **bladder clover**
- **clover**
- **medic**
- **field pea**
- **barley**
- **vetch**
- **wheat**
- **clover**
Biology and impact of *Rhizoctonia solani* (AG8)

(© SARDI, PreDicta B course)

- Adapted to low-medium rainfall and non-wetting soils
- Hyphal network is sensitive to soil disturbance
- Inoculum increases most during Spring
- Yield losses can exceed 50%

(Image: Gupta Vadakattu, CSIRO)
Rhizoctonia symptoms
Katanning rotation trial (Hüberli 2011)

![Graph showing Rhizoctonia solani log(pg DNA/g soil) for different crop rotations. Pre-sow, Chemical fallow, Canola (Cobbler), Wheat (Mace) and Barley (Buloke) are compared. The graph indicates risk levels: High, Med, and Low.]
What are the management options for Rhizoctonia and nematodes?

**Root lesion nematodes**
- Variety choice
- Rotation with a break crop

**Rhizoctonia**
- In furrow and seed treatments (for cereals only)
- Soil disturbance e.g. tillage
- Rotation with canola
What if both diseases occur in the same paddock?

*R. solani*  
High (0-50% yield loss risk)

*P. neglectus*  
Low (0-15% yield loss risk)
What if both diseases occur in the same paddock?

- **P. quasitereoides**: High (0-50% yield loss risk)
- **P. neglectus**: Low (0-15% yield loss risk)
- **R. solani**: High (20-50% yield loss risk)
GRASS VALLEY
– *P. neglectus*, *P. quasitereoides*, *R. solani* (low levels)

2018
- Canola
- Serradella
- Subclover
- Lupin
- Chickpea
- Field pea
- Fallow

2019
- Wheat

Failed chickpea
DUMBLEYUNG

P. *neglectus* – medium levels
*R. solani* – medium levels

<table>
<thead>
<tr>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola</td>
<td>Wheat</td>
</tr>
<tr>
<td>Serradella</td>
<td></td>
</tr>
<tr>
<td>Lupin</td>
<td></td>
</tr>
<tr>
<td>Faba bean</td>
<td></td>
</tr>
</tbody>
</table>
Pratylenchus neglectus in the soil at harvest (2018) - Dumbleyung

![Graph showing P. neglectus/g soil for different crops and seasons.](image-url)
Pratylenchus neglectus in the soil at harvest (2018) - Grass Valley
*P. quasitereoides* in the soil at harvest (2018) – Grass Valley

<table>
<thead>
<tr>
<th>Season</th>
<th>P. quasitereoides/g soil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning</td>
<td>a</td>
</tr>
<tr>
<td>Subclover</td>
<td>a</td>
</tr>
<tr>
<td>Serradella</td>
<td>a</td>
</tr>
<tr>
<td>Lupins</td>
<td>ab</td>
</tr>
<tr>
<td>Field peas</td>
<td>b</td>
</tr>
<tr>
<td>Fallow (cereal)</td>
<td>b</td>
</tr>
<tr>
<td>Fallow (pulse)</td>
<td>b</td>
</tr>
<tr>
<td>Wheat (Mace)</td>
<td>c</td>
</tr>
<tr>
<td>Canola</td>
<td>c</td>
</tr>
<tr>
<td>Wheat (Calingiri)</td>
<td>c</td>
</tr>
<tr>
<td>Barley</td>
<td>c</td>
</tr>
</tbody>
</table>

**PREDICTA B RISK LEVEL**
- High
- Med
- Low
Total nematodes in the soil at harvest (2018) – Grass Valley
*Rhizoctonia solani* AG8 in the soil at harvest (2018) - Dumbleyung

<table>
<thead>
<tr>
<th>Season Beginning</th>
<th>Serradella</th>
<th>Lupins</th>
<th>Canola</th>
<th>Faba beans</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. Solani log pgDNA/g soil</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

PREDICTA B RISK LEVEL
- High
- Med
- Low
Rhizoctonia solani AG8 in the soil at harvest (2018) – Grass Valley
Harvest/Biomass Yields and Gross Margins - Dumbleyung

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield t/ha</th>
<th>Gross Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faba Bean</td>
<td>$64</td>
<td></td>
</tr>
<tr>
<td>Canola</td>
<td>$404</td>
<td></td>
</tr>
<tr>
<td>Serradella</td>
<td>$656</td>
<td></td>
</tr>
<tr>
<td>Lupin</td>
<td>$656</td>
<td></td>
</tr>
</tbody>
</table>
Harvest/Biomass yields – Grass Valley

- Canola
- Wheat (Mace)
- Field pea
- Wheat (Calingiri)
- Lupin
- Barley
- Subclover
- Serradella

Yield t/ha
Summary of crop impacts on pests/disease from Dumbleyung and Grass Valley trials in 2018

<table>
<thead>
<tr>
<th></th>
<th>Sub clover</th>
<th>Faba Bean</th>
<th>Field pea</th>
<th>Lupin</th>
<th>Serradella</th>
<th>Fallow</th>
<th>Canola</th>
<th>Mace (W)</th>
<th>Calingiri (W)</th>
<th>Barley</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P. neglectus</strong></td>
<td>😞</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
</tr>
<tr>
<td><strong>P. quasitereoides</strong></td>
<td>😊</td>
<td>N/A</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
</tr>
<tr>
<td><strong>R. solani</strong></td>
<td>😊</td>
<td>😟</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
</tr>
</tbody>
</table>

- 😞 Increases RLN or *R. solani*
- 😟 Slight increase in RLN or *R. solani*
- 😊 Decrease in RLN or no change to slight increase in *R. solani*

Weed control is important to manage *R. solani*
KEY MESSAGES

• Canola isn’t a break crop in a multi-peril paddock
• Legumes reduced root lesion nematode numbers
• Legumes didn’t increase *Rhizoctonia solani* levels as much as cereals
• Cereals increase the levels of root lesion nematodes and *Rhizoctonia solani*
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Thank you
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