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

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"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!**
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

Hüberli 2015
Katanning rotation trial (Hüberli 2011)

![Graph showing Rhizoctonia solani log(pg DNA/g soil) across different crop rotations and PREDICTA B risk levels. Pre-sow, Chemical fallow, Canola (Cobbler), Wheat (Mace), Barley (Buloke) are compared. The graph indicates different risk levels: High, Med, 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  Barley
Serradella  Wheat – Calingiri
Subclover  Wheat – Mace
Lupin  Fallow
Chickpea
Field pea
Fallow

2019

Wheat

Failed chickpea
# DUMBLEYUNG

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

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

<table>
<thead>
<tr>
<th>Season Beginning</th>
<th>Lupins</th>
<th>Faba beans</th>
<th>Serradella</th>
<th>Canola</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
</tbody>
</table>

P. neglectus/g soil

- **High (Red)**
- **Med (Yellow)**
- **Low (Green)**

**Risk Levels**
- 0
- 5
- 10
- 15
- 20
- 25
- 30
**Pratylenchus neglectus** in the soil at harvest (2018) - Grass Valley

![Graph showing the P. neglectus/g soil for various crops](image-url)

- **Season Beginning**
- **Field peas**
- **Lupins**
- **Fallow (pulse)**
- **Serradella**
- **Fallow (cereal)**
- **Subclover**
- **Barley**
- **Wheat (Mace)**
- **Canola**
- **Wheat (Calingiri)**

**Risk Level**
- **High**
- **Med**
- **Low**
P. quasitereoides in the soil at harvest (2018)– Grass Valley

P. quasitereoides/g soil.
Total nematodes in the soil at harvest (2018) – Grass Valley

Season Beginning, Serradella, Lupins, Subclover, Field peas, Fallow (Pulse), Fallow (Cereal), Wheat (Mace), Canola, Barley, Wheat (Calingiri)

Total RLN/g soil

PREDICTA B RISK LEVEL
High, Med, Low
**Rhizoctonia solani AG8 in the soil at harvest (2018) - Dumbleyung**

- **Season Beginning**
- **Serradella**
- **Lupins**
- **Canola**
- **Faba beans**

**Risk Levels**:
- **High**
- **Med**
- **Low**

**Predicta B**

- R. Solani log pgDNA/g soil

- At harvest:
  - **Season Beginning**: High
  - **Serradella**: Medium
  - **Lupins**: Low
  - **Canola**: High
  - **Faba beans**: High
*Rhizoctonia solani AG8* in the soil at harvest (2018) – Grass Valley

![Graph showing the log pgDNA/g soil for various crops.](image)

**Season Beginning**
- Subclover
- Serradella
- Lupins
- Fallow (pulse)
- Field peas
- Fallow (cereal)
- Canola
- Wheat (Mace)
- Barley
- Wheat (Calingiri)

**R. solani log pgDNA/g soil**
- 0
- 0.5
- 1
- 1.5
- 2
- 2.5
- 3

**PREDICTA B RISK LEVEL**
- High
- Med
- Low

The graph illustrates the log pgDNA/g soil levels for different crops, with aRisk Level prediction based on these levels.
Harvest/Biomass Yields and Gross Margins - Dumbleyung

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

Yield t/ha

- Canola
- Wheat (Mace)
- Field pea
- Wheat (Calingiri)
- Lupin
- Barley
- Subclover
- Serradella
Summary of crop impacts on pests/disease from Dumbleyung and Grass Valley trials in 2018

<table>
<thead>
<tr>
<th>Crop</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>P. neglectus</td>
<td>😞</td>
<td>😊</td>
<td>😊</td>
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<td>😊</td>
<td>😊</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
<td>😞</td>
</tr>
<tr>
<td>P. quasitereoides</td>
<td>😊</td>
<td>N/A</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😊</td>
<td>😞</td>
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</tr>
<tr>
<td>R. solani</td>
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<td>😞</td>
<td>😊</td>
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<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
Visit dpird.wa.gov.au

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