Rhizoctonia control improved by liquid banding of fungicides

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Take home messages

- SARDI and DAFWA field trial results show banding fungicides above and below seed, below seed only or below seed combined with a seed treatment can improve control of Rhizoctonia.
- APVMA is currently reviewing submissions to enable banding of selected fungicides to improve control of Rhizoctonia; if approved, registration will be granted in 2015.
- Permits have been approved for large scale evaluation in 2014 – watch out for local field days conducted by Syngenta and Bayer CropScience.
- Fungicide treatments alone will not eliminate patches and need to be used as part of an integrated management program.

Introduction

New fungicides and methods of application are being developed to help prevent yield losses caused by Rhizoctonia. Several products have recently been registered for suppression of Rhizoctonia (see Cereal Seed Treatments 2014 Factsheet).

The first field trials to evaluate banding fungicides for Rhizoctonia control were conducted in WA in 2009 at Katanning and Northam (funding: GRDC) and SA in 2010 at Geranium (funding: SAGIT/Syngenta). In the SA trial the best treatment was shown to be a combination of fungicides applied as “split” streams on the soil surface and in-furrow below the seed. This combination produced a 0.6 t/ha yield responses in knife point and rippled coulter sown treatments (knife point yielded 0.25 t/ha more than rippled coulter). The application above the seed was targeted to protect the crown roots and the stream at the base of the furrow to protect the seminal roots.

This paper summarises the yield results from most of the field trials conducted in SA and WA from 2011 to 2013 to evaluate different ways of banding fungicides to reduce yield losses caused by Rhizoctonia and generate efficacy data to support label registration by the APVMA.

Rhizoctonia – key features

Research projects in SA and WA funded by GRDC and SAGIT have made significant progress in understanding Rhizoctonia solani Kühn AG-8 and improving management options. This fungus is adapted to dry conditions with most inoculum occurring in the top 3-5 cm of soil. It develops rapidly after the opening rains to form a hyphal network, and can attack crop roots throughout the growing season. Damage is greatest when root growth is restricted and/or soil temperatures drop to around 10°C. It is the severe damage to seedling roots which results in the characteristic bare patches.
In many early sown crops root damage is delayed until around tillering when soil temperature drops to around 10°C, this slows root growth and the fungus can attack seminal and crown roots causing uneven crop growth. Uneven growth, rather than bare patches, is now the most common symptom in the majority of crop paddocks affected by *Rhizoctonia*.

Inoculum levels increase during the growing season, especially during spring, and reach maximum levels as the crop dries off. Cereals and grasses are the main hosts; cereals following cereals or grassy pastures are at greatest risk.

**Results and Discussion**

The APVMA is currently considering applications from Syngenta and Bayer CropScience for label recommendations to band fungicides for *Rhizoctonia* control in wheat and barley. Only the results of a Syngenta coded product (SYNSIF1) are presented in this paper to avoid supporting off-label use of other products.

Table 1. Summary of net wheat yield responses (t/ha) in *Rhizoctonia* fungicide application trials with SYNSIF1 and Vibrance™.

<table>
<thead>
<tr>
<th>Site</th>
<th>Year</th>
<th>Pre-sow Rhiz DNA (pg/g soil)</th>
<th>Untreated yield (t/ha)</th>
<th>Vib.</th>
<th>Vib. + IF rate 1</th>
<th>rate 1 IF</th>
<th>rate 3 IF</th>
<th>rate 2 (% Sur + ½ IF)</th>
<th>rate 3 (% Sur + ½ IF)</th>
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</thead>
<tbody>
<tr>
<td>Weetulta (SA)</td>
<td>2013</td>
<td>205</td>
<td>0.88</td>
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<td></td>
<td>0.40**</td>
<td></td>
<td>0.49**</td>
<td></td>
</tr>
<tr>
<td>Lameroo (SA)</td>
<td>2013</td>
<td>106</td>
<td>2.29</td>
<td>0.09</td>
<td>0.18**</td>
<td>0.13**</td>
<td>0.19**</td>
<td>0.24**</td>
<td>0.20**</td>
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<td>Wynanka (SA)</td>
<td>2013</td>
<td>257</td>
<td>1.79</td>
<td>0.03</td>
<td>0.22**</td>
<td>0.28**</td>
<td>0.21**</td>
<td>0.38**</td>
<td>0.53**</td>
</tr>
<tr>
<td>Katanning(WA)</td>
<td>2013</td>
<td>6</td>
<td>4.28</td>
<td>0.04</td>
<td>0.00</td>
<td>-0.02</td>
<td>0.04</td>
<td>0.15*</td>
<td>0.23*</td>
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<tr>
<td>Karoonda (SA)</td>
<td>2012</td>
<td>138</td>
<td>1.36</td>
<td>0.25**</td>
<td>0.47**</td>
<td>0.33**</td>
<td>0.42**</td>
<td>0.39**</td>
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<tr>
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<td>2.88</td>
<td>0.02</td>
<td>0.14*</td>
<td>0.14*</td>
<td>0.09</td>
<td>0.11</td>
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<tr>
<td>Lake Grace (WA)</td>
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<td>0.05</td>
<td>0.02</td>
<td>0.08*</td>
<td>0.11*</td>
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<tr>
<td>Keith (SA)</td>
<td>2011</td>
<td>76</td>
<td>2.70</td>
<td>0.02</td>
<td>0.07</td>
<td>0.14</td>
<td></td>
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<tr>
<td>Minnipa (SA)</td>
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<td>109</td>
<td>1.98</td>
<td>0.08**</td>
<td>0.09**</td>
<td>0.12**</td>
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</tr>
<tr>
<td>Yumali (SA)</td>
<td>2011</td>
<td>219</td>
<td>1.33</td>
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<tr>
<td>Corrigin (WA)</td>
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<td>Ongerup (WA)</td>
<td>2011</td>
<td>161</td>
<td>1.82</td>
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<td>0.00</td>
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</tr>
</tbody>
</table>

* Significant (P < 0.05) or ** Significant (P < 0.001), compared to untreated plots

Vib = Vibrance™ seed treatment applied at 360 ml/100 kg seed, IF = SYNSIF1 applied in-furrow (3-4 cm below seed), Sur = SYNSIF1 applied on furrow surface.

Table 2. Summary of net barley yield responses (t/ha) in *Rhizoctonia* fungicide application trials with SYNSIF1 and Vibrance™.

<table>
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<tr>
<th>Site</th>
<th>Year</th>
<th>Pre-sow Rhiz DNA (pg/g soil)</th>
<th>Untreated yield (t/ha)</th>
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<tr>
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<td>2013</td>
<td>106</td>
<td>2.77</td>
<td>0.21**</td>
<td>0.17**</td>
<td>0.30**</td>
<td>0.31**</td>
<td>0.40**</td>
<td>0.37**</td>
</tr>
<tr>
<td>Wynanka (SA)</td>
<td>2013</td>
<td>257</td>
<td>1.93</td>
<td>0.09</td>
<td>0.62**</td>
<td>0.69**</td>
<td>0.53**</td>
<td>0.69**</td>
<td>0.87**</td>
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<tr>
<td>Kojonup (WA)</td>
<td>2013</td>
<td>22</td>
<td>4.38</td>
<td>0.04</td>
<td>0.18</td>
<td>-0.21</td>
<td>0.36*</td>
<td>0.25*</td>
<td>0.13</td>
</tr>
<tr>
<td>Karoonda (SA)</td>
<td>2012</td>
<td>138</td>
<td>2.63</td>
<td>-0.12</td>
<td>0.18</td>
<td>0.44*</td>
<td>0.49*</td>
<td>0.24</td>
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<tr>
<td>Port Julia (SA)</td>
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<td>102</td>
<td>2.99</td>
<td>-0.03</td>
<td>0.01</td>
<td>0.16</td>
<td>-0.15</td>
<td>0.15</td>
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<tr>
<td>Calingiri (WA)</td>
<td>2012</td>
<td>13</td>
<td>1.20</td>
<td>0.05</td>
<td>0.17**</td>
<td>0.25**</td>
<td>0.26**</td>
<td>-0.05</td>
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<td>0.20**</td>
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<tr>
<td>Salmon Gums (WA)</td>
<td>2011</td>
<td>136</td>
<td>0.46</td>
<td>0.01</td>
<td>0.0</td>
<td>-0.01</td>
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</tbody>
</table>

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* Table taken from a technical document, reproduced with permission.
Yield responses for 6 main treatments, all sown with knife points, are presented in Tables 1 and 2 for wheat and barley, respectively (note: some treatments were evaluated in recent years only). The results are presented as net yield increases (t/ha) for each treatment, with the site untreated yields (t/ha) and pre-sowing Rhizoctonia levels included to help characterise each site. Rhizoctonia field trials are inherently variable and it was difficult to detect statistically significant yield responses less than 10% and sometimes larger.

The treatments producing the most consistent yield responses had fungicide applied on the furrow surface behind the press wheel (above the seed) in combination with fungicide applied as a stream at the base of the furrow about 3.5 cm below the seed. This “split” application produced significant yield responses in wheat in 6 of 7 trials at the medium rate (rate 2) and 4 of 4 trials at the high rate (rate 3). In barley, significant responses were seen in 3 of 6 trials at the medium rate and 2 of 3 trials at the high rate.

Application of SYNSIF1 in-furrow only produced significant yield increases in wheat in 7 of 11 trials at the medium rate and 5 of 7 trials at the high rate while in barley it was 5 of 10 trials at the medium rate and 5 of 6 trials at the high rate.

Banding below the seed at the low rate in combination with Vibrance™ seed treatment increased yield significantly in wheat in 6 of 11 trials and in barley 4 of 10 trials. Seed treatment alone increased yield significantly in 2 of 11 wheat trials and 1 of 10 barley trials.

The surface application treatment applied behind the press wheel in SA was applied using a low volume narrow angle nozzle set to spray along its narrow side creating a narrow band approx. 2 cm wide. One trial conducted in SA in 2013 found no significant differences when the surface band was applied as a fine jet, a 2 cm wide, or an 8 cm wide surface band. Results may have been different in a lower rainfall year. In WA, the surface band treatment was applied as a trickle in a separate pass following the first pass application of fungicide as a trickle below the seed using GPS controlled auto-steer.

Summary of other factors that reduce risk of Rhizoctonia

- SARDI/DAFWA field trials with Vibrance™ and EverGol® Prime seed treatments showed that these products increased yield by 5% on average.
- Non-cereals, especially canola and pulses, provide useful reduction in Rhizoctonia levels for the following crop.
- Frequent summer rainfall combined with summer weed control.
- Autumn “green bridge” controlled.
- Early sowing and soil disturbance below seed facilitates root growth down soil profile.
- Knife point soil openers reduce risk of Rhizoctonia compared to discs.
- Consider increasing seeding rate to reduce impact of lost tillers from Rhizoctonia damage to crown roots.
- Encourage rapid seedling vigour by applying adequate nutrition – in particular minimise N deficiency by banding N below the seed and do not incorporate stubble.
- Address in-crop nutrient/trace element deficiencies with foliar application.

Potential high soilborne disease risk in 2014:

- Conditions in 2013 favoured increases in Rhizoctonia, crown rot, take-all and Pratylenchus.
- If summer rainfall continues to be low.
- Risk will be further increased if season breaks late and soils are cold.
Identifying high risk paddocks
If sowing cereals back on cereals in 2014 then consider a PreDicta B test.

Important change to sampling strategy for PreDicta B

- Target sampling along the rows of the last cereal crop.
- Collect three 1X10 cm cores (AccuCore) from 15 different locations within the target sampling area/paddock.
- **Addition of stubble (if present)** – at each of the 15 sampling locations, select one piece of stubble from the base of a cereal plant or grassy weed, discard stubble above the first node and add the lower portion to the sample bag.
- Inadequate sampling is likely to result in a failure to warn growers of a significant risk, especially from crown rot. Addition of stubble that includes the base of the plant should also improve detection of take-all and *Rhizoctonia* (research to improve sampling strategy is continuing).

Future work

- Explore ways to reduce impact of *Rhizoctonia* in crops sown with disc seeders, including optimising fungicide placement and reduced hair pinning of inoculum.
- Better understand the role of in-season rainfall.
- Investigate varietal differences in hosting *Rhizoctonia*.

Further reading:
GRDC Factsheet March 2012

Cereal Seed Treatments 2014 Factsheet by Hugh Wallwork available from:

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