Blind Seed Disease Control: Fungicide Response and Effect on AR37 Endophyte

Key Points
- Blind seed is a potentially devastating seed disease which under damp weather conditions during flowering can severely reduce seed line germination (percentage).
- The infection of blind seed disease is more probable in short, open crops with less bulk at flowering.
- Blind seed disease and ergot were significantly reduced by sequential fungicide treatments especially treatments based around Proline.
- Germination levels were increased from 72 to 94% by the best fungicide treatments.
- There is a trend for these treatments to depress AR37 viable endophyte levels.

Introduction
Blind seed disease (*Gloeotinia temulenta*) is a fungal infection that kills the developing embryo. The infected seed looks normal but is dead. A series of FAR funded trials have shown that some triazole fungicides used for stem rust control can reduce infection rates. Blind seed disease occurs in epidemics and is associated with wet weather conditions over flowering and early seed fill. Previously FAR has reported on blind seed disease in FAR Arable Updates Herbage No. 10, and 52. These should be read in conjunction with this update.

Ergot (*Claviceps purpurea*) is a fungus infection that takes over the seed resulting in a black seed. The disease is often worst in late flowering cultivars. There are no reports on the effectiveness of fungicide on reducing ergot incidence.

Methods
In FAR Arable Update, Herbage No. 52 data was presented on how canopy structure influenced blind seed disease infection. This information was used to enhance the blind seed infection in these trials. A three year old grazed pasture (lax grazed the previous summer) of perennial ryegrass with AR37 endophyte was closed from grazing in early October 2007 at the AgResearch farm, Lincoln. No nitrogen was applied after closing and Moddus plant growth regulator applied at 2.0 L/ha. This created an open seed crop that would be more susceptible to blind seed disease.

The trial had seven fungicide treatments (Table 1) with three replicates in a randomised block design. The fungicides used were: Amistar® (azoxystrobin 250 g/L); Folicur® (tebuconazole 250 g/L); Proline® (prothioconazole (250 g/L) and Protek® (carbendazim 500 g/L). Plots were 4 x 4 m. Treatments were applied at early flowering (9 December) and mid seed fill (24 December).

Results
There is close agreement between the glasshouse emergence and germination percentage rates (Table 1). The germination for the nil fungicide control was 72% significantly lower than most of the fungicide treatments that had germination rates from 79 to 94%. The low value was from a single late application of fungicide suggesting the flowering application is critical. The best treatments had Proline 400 ml/ha at flowering followed by either Proline + carbendazim or Folicur + carbendazim at mid seed fill. These treatments had a germination of between 87 and 94%.

The untreated control had 24% blind seed disease infection (Table 1). There was a strong negative correlation (R²=0.99) between blind seed disease infection and germination (Figure 1).
There was a low incidence of ergot (4%) in the untreated control. Fungicide treatments reduced the incidence of ergot with treatments that were most effective on reducing blind seed generally showing activity at reducing ergot.

Endophyte transmission was low, even in the untreated control (possible cultivar interaction – note cultivar was an unreleased breeding line). However some fungicide applications reduced endophyte levels in harvested seed. Contact your company representative to discuss fungicide applications when growing endophyte infected seed crops.

**Conclusion**

We have demonstrated that some fungicides have good control of blind seed disease and can lift seed germination from the low 70’s to >90%. The trial also demonstrated that ergot infection can be reduced by treatments that are effective against blind seed. There is a balance between maintaining AR37 endophyte levels and controlling blind seed disease. In particular care is needed with Proline fungicide used on AR37 crops.

**Acknowledgements**

FAR would like to thank AgResearch and the National Seed Laboratory for this research.

Amistar® is a trademark of a Syngenta group company. Proline® and Folicur® are registered trademarks of Bayer. Protek® is a registered trademark of Tapuae Partnership NZ.

Table 1. Fungicide treatments, rates and dates of application, seedling emergence, germination, blind seed (BS), ergot and viable endophyte percentage (AR37), 2007/08 season, Lincoln.

<table>
<thead>
<tr>
<th>TRT</th>
<th>9-Dec Fungicide</th>
<th>Rate (ml/ha)</th>
<th>24-Dec Fungicide</th>
<th>Rate (ml/ha)</th>
<th>Emerge %</th>
<th>Germ %</th>
<th>BS%</th>
<th>Ergot %</th>
<th>Endo+ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>nil</td>
<td>0</td>
<td>nil</td>
<td>0</td>
<td>73</td>
<td>72</td>
<td>24</td>
<td>4.0</td>
<td>78</td>
</tr>
<tr>
<td>2</td>
<td>nil</td>
<td>0</td>
<td>Proline + carbendazim</td>
<td>400+500</td>
<td>68</td>
<td>79</td>
<td>18</td>
<td>3.0</td>
<td>72</td>
</tr>
<tr>
<td>3</td>
<td>Proline</td>
<td>400</td>
<td>Proline + carbendazim</td>
<td>400+500</td>
<td>90</td>
<td>94</td>
<td>5</td>
<td>0.7</td>
<td>70</td>
</tr>
<tr>
<td>4</td>
<td>Proline</td>
<td>600</td>
<td>Folicur + carbendazim</td>
<td>300+500</td>
<td>90</td>
<td>87</td>
<td>12</td>
<td>1.0</td>
<td>64</td>
</tr>
<tr>
<td>5</td>
<td>Folicur+Az</td>
<td>300+500</td>
<td>Folicur + carbendazim</td>
<td>300+500</td>
<td>84</td>
<td>82</td>
<td>16</td>
<td>1.3</td>
<td>86</td>
</tr>
<tr>
<td>6</td>
<td>Proline + Az</td>
<td>400+500</td>
<td>Folicur + carbendazim</td>
<td>400+500</td>
<td>93</td>
<td>91</td>
<td>7</td>
<td>1.3</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>Folicur+Az</td>
<td>440+500</td>
<td>Folicur + carbendazim</td>
<td>300+500</td>
<td>85</td>
<td>86</td>
<td>11</td>
<td>3.0</td>
<td>69</td>
</tr>
</tbody>
</table>

LSD 5% | 7.5 | 7 | 7 | 1.6 | 15
F. prob | <0.001 | <0.001 | 0.002 | 0.005 | <0.01
CV % | 5 | 5 | 30 | 44 | 12

Az = azoxystrobin