Key messages

- Differences in resistance to eyespot were observed in bread wheat varieties in trials at Cummins, Templars and Tarlee and in barley varieties in trials at Templars and Tarlee.

- Fungicide treatments were demonstrated to have good efficacy against eyespot and it is expected this will lead to label extensions for control of eyespot in cereals in Australia.

- Eyespot is becoming an increasing problem in the medium to high rainfall grain growing areas of SA (including the area around Cummins) due to farming systems moving to stubble retention, direct drill and more cereals in rotations. Yield losses have not been quantified in Australia, but overseas experiences suggest an average of 5% yield loss from eyespot, with losses as high as 40% occurring in some circumstances. This fungal disease is stubble-borne and affects stem bases, causing eye-like lesions which can girdle the stem. Yield losses occur as a direct result of the stem lesions and also from plants lodging (due to weakened stem bases) which makes it difficult or impossible to harvest affected plants. Overseas, eyespot control is provided through varietal resistance and fungicide application. In Australia no fungicides are registered for control of eyespot, and until 2013 there has been no research conducted into the presence of resistance amongst commercial varieties. As far as we are aware none of the breeding companies in Australia have been breeding for this trait.

- At Cummins, barley was less affected by eyespot than was bread wheat. However, at trial sites at Tarlee and Templars the variety La Trobe and, to a lesser extent, Hindmarsh were badly affected by eyespot. Compass was less affected by eyespot at all sites.

Why do the trials?

These variety and fungicide efficacy trials will assist in identifying resistance sources for eyespot and will provide data to support chemical companies acquiring label extensions to register fungicides for use against eyespot in cereals in Australia.

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This work is GRDC-funded and follows on from a GRDC-funded fast-tracked trial (managed in collaboration with Agrilink Agricultural Consultants, the Mid North High Rainfall Zone farming systems group and Bayer CropScience). Independent trials were also run in 2013 by Landmark - Cummins Agricultural Services (Patrick Head).

How was it done?

The Cummins site was located in a paddock which had eyespot problems in the 2013 wheat crop and had a heavy stubble load carrying over from that crop. Two other sites, at Tarlee in the Mid North and at Templars on the Adelaide Plains, were managed in a similar manner and had similar treatments.

To encourage eyespot expression, the trial was sown early in the seeding window (19 May 2014) at a high plant density (250 plants/m²) and with high nitrogen inputs (187 units of N). Trials were sown and managed by Cummins Agricultural Services. Plots were 5 rows (2 m) wide by 8 m long and each trial had three replicates.

Variety screening. Twenty one bread wheat and four barley varieties were screened for resistance to eyespot. Many of the varieties are in general commercial use and were chosen for screening as they represent a range of genetic backgrounds (including genes for resistance to crown rot) and maturities.

Fungicide efficacy. The variety Mace was used in the fungicide trial and products assessed were all registered for use in cereals in Australia, but not for eyespot control. Eleven products (including plant growth regulators) were represented in the fungicide trial, which was done in collaboration with Adama Agricultural Solutions Ltd, BASF Australia Ltd, Bayer CropScience Australia and Syngenta Australia Pty Ltd. Details of fungicides assessed cannot be presented here as they are not registered for control of eyespot in cereals in Australia.

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Eyre Peninsula Farming Systems 2014 Summary
Fungicide treatments were applied using a hand boom on 14 July at the start of stem elongation (GS30).

Stem samples were assessed for eyespot expression on 22 October 2014, when plants were at late grainfill. A total of 25 stems were assessed in each plot, with 8-9 stems taken from each of the 3 inner rows of the plot. A scoring scale of 0-3 was used, where:

0 = no lesions.
1 = slight eyespot – small lesion(s) on less than half the stem circumference.
2 = moderate eyespot – lesion(s) on at least half the stem circumference.
3 = severe eyespot – lesion(s) girdling the whole stem; tissue softened, lodging would occur readily.

This scale was taken from Scott and Hollins (1974) and their formula was used to calculate a disease index: (1*tillers in score 1 + 2*tillers in score 2 + 3*tillers in score 3 / total tillers scored) * (100 / 3).

Plots were scored for lodging on 9 October 2014, with the % of the plot showing lodging being recorded.

What happened?
The trials established well and high levels of eyespot (96% incidence on Mace stems) occurred due to the Decile 9 winter providing many rainy days during tillering and early stem extension. Weeds, other diseases and insect pests were adequately controlled. Low but significant numbers of volunteer Mace (very susceptible to eyespot) plants were present in both trials and this may have influenced results in the variety screening trial by masking entries with very low eyespot expression.

Variety screening. Barley varieties were mildly affected by eyespot when compared with wheat varieties and consequently also showed least lodging (Figure 1), with no differences in disease expression being found between the four varieties. At the other two sites in this research project the same barley varieties were screened and there were differences between the varieties - La Trobe was badly affected by eyespot and Hindmarsh was only slightly less affected both in disease expression and an associated increase in lodging.

Figure 1 Screening for eyespot resistance in commercial barley varieties (white columns) and bread wheat varieties (black columns) at Cummins in 2014. Raw data are presented here, but analyses were done on transformed data which were adjusted for spatial variability.
Compass was not seriously affected by eyespot at any of the sites.

The worst affected wheat varieties included Shield, Cobra, Mace, Scout and Axe. The least affected wheat varieties included Trojan, Emu Rock, Spitfire and Sunguard as well as the long season wheat varieties Wakelin and Gazelle. Lodging problems were worst for Axe, Mace and AGT Katana.

**Fungicide efficacy.** All the products applied provided some protection against eyespot with the disease index ranging from 15 to 54, compared with a disease index of 74 for the untreated control. Yield improvements over the untreated control were also achieved, with yield increases ranging from 8% to 25% across the products applied. These results make it likely that data packages will be sent to the APVMA in the next few months requesting label extensions for eyespot control in cereals for at least some of the products assessed in this trial.

**What does this mean?**

There is variation amongst the current Australian bread wheat varieties in resistance to eyespot. This means that where eyespot is a problem, the best locally adapted varieties with some resistance to eyespot can be selected and varieties which are very susceptible to eyespot can be avoided. This variation in resistance will also provide a base for breeding commercial varieties with improved eyespot resistance. It is interesting to speculate whether the resistance genes for crown rot in Trojan, Emu Rock, Sunguard and Spitfire are conferring some resistance to eyespot as these varieties are amongst the most resistant to both diseases. Variety screening will continue at three sites in 2015. Entries will be guided by 2014 results and will include widely grown current/potential commercial varieties.

Although the four barley varieties screened at Cummins had similar and good levels of resistance to eyespot, this was not the finding from the Mid North and the Adelaide Plains screening trials. At these sites, La Trobe and, to a lesser extent, Hindmarsh had significant disease expression with associated increases in lodging. It is unclear why this inconsistency in results occurred between the sites. It is possible that it is a season/site effect or due to chance alone. However, it is also possible that the eyespot isolate at Cummins differs from those in the Mid North and on the Adelaide Plains (supported by some anomalies in the PredictaB results for the sites) and this possibility will be explored in 2015.

Fungicide efficacy results from the Cummins trial are consistent with findings from trials undertaken at Cummins by Landmark – Cummins Agricultural Services in 2013 and it is anticipated that label extensions to include eyespot control in cereals for one or more products may become available this season. Fungicide efficacy trials will continue at three sites in 2015 to ensure that data packages for label extensions can be submitted prior to the 2016 season. Products registered for eyespot control in cereals should be available during the 2016 season. Once products are registered for use on eyespot, details of results from the fungicide efficacy trials will be made available in the EPFS Summary.

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