3. Eyespot in the South East

Margaret Evans (marg.evans@sa.gov.au) and Hugh Wallwork (hugh.wallwork@sa.gov.au), SARDI, Plant Research Centre, Urrbrae

PROJECT ID: DAS000139 - 'Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease in South Australia' and DAS00109 "National Variety Trials".

KEY MESSAGES

- Know the risk of yield loss from eyespot before sowing a cereal - inspect stem bases (lodging does not always occur) in a previous cereal crop or take soil samples pre-sowing and submit them to PreDicta B for analysis.
- Select less susceptible varieties which are well adapted to the area - untreated they will perform better and they may also be more responsive to fungicide application, particularly where disease pressure is high. Avoid varieties with weak straw strength as they are more likely to lodge when affected by eyespot.
- No fungicides are registered at present for eyespot management, but a number are in the process of registration. Once these are registered - use the correct rate (lower rates can be less effective); apply before canopy closure (GS30-31 is usually recommended); use high water rates; target the base of the plant.
- Delays (due to waterlogging) in fungicide application until after early stem elongation may reduce eyespot incidence and severity but may not give a yield response.
- Inoculum carryover is unlikely to be influenced by variety resistance alone but is likely to be reduced where a fungicide is applied prior to canopy closure. Greatest reductions in inoculum carryover were seen where two fungicide applications were made (tillering plus GS30-31) or where one fungicide application was made to a less susceptible variety.

Background

Eyespot caused by the fungus Oculimacula yallundae continues to be an increasing problem in the higher rainfall grain growing areas of South Australia. This increase is mainly due to farming systems moving to stubble retention, direct drill and more cereals in rotations as well as to the trend to sowing cereals earlier.

Infection of stem bases by this pathogen causes the eye-like lesions which give eyespot its name. Yield losses from this disease occur as a direct result of the stem lesions and, secondarily, from plants lodging due to weakened stem bases which makes harvesting difficult. Infection occurs when spores are rain-splashed onto plant bases and this is followed by three or more days of very high humidity (more than 3 mm of rain on each day). Multiple infection events may occur in a season and the earlier this happens, the more damaging eyespot is likely to be.

Eyespot control includes fungicide application and the use of partial resistance in varieties but as eyespot has a restricted distribution in Australia no fungicides are currently registered for eyespot management. This GRDC funded research program aims to provide growers with information which will reduce losses due to eyespot by improving our understanding of:

- Resistance responses of commercial cultivars and breeders' lines to eyespot.
- Yield losses due to eyespot in cultivars with different resistance rankings for eyespot.
- The effectiveness of delayed fungicide application for eyespot management in the South East.
- Interactions between MS and S varieties and fungicide efficacy.
- Impact of fungicides, varieties and combinations on eyespot inoculum carryover.

Activities

Three variety screening (2015-2017) and two fungicide efficacy (2016, 2017) trials have been undertaken in the South East, located in paddocks with high levels of eyespot inoculum at Kangaroo Inn (Richard Kirkland's property). Entries in the variety screening trials and treatments in the fungicide efficacy trials were selected in consultation with local growers, Struan staff and MFMG to provide information relevant to South East conditions and farming systems.

Results & Discussion

Eyespot symptoms cannot be easily seen until around head emergence, which is too late for managing this disease. This means that the most important tool for managing eyespot is to know the risk level for each paddock prior to sowing a cereal crop. Eyespot risk can be assessed by either inspecting stem bases (lodging does not always occur) in a previous cereal crop or by taking soil samples pre-sowing and submitting them to PreDicta B for analysis.

The main in-crop control strategy used for eyespot management is fungicide application early in stem elongation, prior to canopy closure. No fungicides are currently registered for managing eyespot in cereals in Australia. Fungicide efficacy trials supported by GRDC in 2014-2015 have contributed data to support submissions to the APVMA. As a result, a number of products are in the process of label extension or registration for eyespot management. Providing the reviewers support the applications, the following products should be available over the next 1-4 years:

- Registration of Aviator® Xpro® @ 500mL/ha (Bayer) has been applied for and is expected (but not guaranteed) by the end of May 2018.
- Registration of Soprano® 500 SC @ 125mL/ha (Adama) has been applied for and might be available by the end of 2018.
- A label extension for Radial® @ 840mL/ha for eyespot management will be submitted by mid-2018 and might be available by mid-2019.
- Syngenta expects to have 2 products with label extensions for suppression of eyespot in place by 2020.

Once fungicides are registered for eyespot control, the choice of chemical used will not be as important as getting the application right. Keys to this are – use the correct rate (lower rates can be less effective); apply before canopy closure (GS30-31 is usually recommended); use high water rates; target the base of the plant. Remember that there can be multiple infection times and that an early fungicide application may need to be followed up with another application at GS30-31. In the South East, waterlogging can make timely fungicide application difficult and this raises the question of how effective is a late application likely to be. Limited trial results suggest fungicide application after GS30-31/canopy closure is unlikely to provide an economic advantage.

Varietal resistance is also important for in-crop eyespot management. Screening trials undertaken 2014-2017 (Table 1) have demonstrated that a range of resistance levels are present in current South Australian cereal varieties, but that none have true resistance to eyespot. Despite this, the partial resistance that is available in varieties such as Trojan does assist in reducing losses from eyespot and appear to improve fungacide efficacy when there is extreme disease pressure.

Table 1: Provisional eyespot resistance ratings based on 2014 - 2017 data.

At Cummins these varieties rank as MRMS and at other sites they rank as S

Based on one data set only

Main Season Wheat	
Trojan	MS
Darwin	MSS
Emu Rock	MSS
Pascal	MSS
Scepter	MSS
Zircon	MSS
Arrow	S
Beckom	S
Chief CL+	S
Cobra	S
Corack	S
Cosmick	S
Cutlass	S
Grenade CL+	S
Harper	S
Hatchett CL+	S
Havoc	S
Mace	S
Scout	S
Shield	S
Tenfour	S
Tungsten	S
Wyalkatchem	S

Long Season Wheat	
Beaufort	MRMS
Forrest	MS
Gazelle	MS
Bolac	MSS
Impala	MSS
Manning	MS
Orion	S
Wedgetail	S

Durum Wheat	
Hyperno	MS
Saintly	MS
Aurora	MSS

Barley	
Fathom	MR-MS
Oxford	MR-MS
Hindmarsh	MRMS-S
La Trobe	MRMS-S
Rosalind	MS
Compass	MS
Scope	MS
Spartacus	MS
Planet	S

Triticale	
Fusion	MS

Applying fungicide to a moderately susceptible variety was more effective at reducing inoculum carryover than applying fungicide to a susceptible variety (Table 2). Two fungicide applications were more effective than one application at reducing inoculum carryover where inoculum levels were very high (Table 2). These findings need to be confirmed in further trials, but they suggest that combining fungicide application(s) with variety resistance may assist in managing eyespot inoculum levels in cereal intensive rotations.

Table 2: Eyespot inoculum (copies) carryover into 2017 after different varieties were treated with fungicide at GS30-31 in 2016 - Kangaroo Inn. Inoculum levels were determined by taking soil samples pre-sowing and submitting the samples for PreDicta B analysis - a level of 2,000 copies is unlikely to cause yield loss, a level of 53-59,000 copies may cause some yield loss and all other levels will cause significant yield loss if seasonal conditions are conducive and the crop is not treated.

Variety	Untreated	Fungicide Treated
Mace (S)	850,000	59,000
Trojan (MS)	1,510,000	2,000
Revenue	4,000,000	1,700,000
		53,000 (tillering + GS30)

Conclusions

Findings from 2016 and 2017 suggest that variety susceptibility rating and timing of fungicide application can affect eyespot expression and yield as well as carryover of inoculum into the next season.

Where eyespot inoculum is high, yield improvements are likely to result from:

- Selecting more resistant varieties.
- Applying a registered fungicide (none available at present, but it is anticipated at least one registered product will be available in the 2017 season).
- Combining a more resistant variety with a fungicide application (once registered fungicides are available).

They also suggest that fungicide applied later than early stem elongation (recommended timing, with the canopy still open to allow good coverage of the stem bases) may reduce eyespot incidence and severity but may not give a yield response.

ACKNOWLEDGMENTS

- Thanks to Richard Kirkland and family for providing trial sites on their property at Kangaroo Inn and to Amanda Pearce, Matthew Hoskings, Ian Ludwig and the SARDI New Variety Agronomy team at Struan for managing the sites, applying the fungicides, changing spore trap tapes and helping with sample collection.