



## SOUTHERN REGION

# EYESPOT IN MEDIUM AND HIGH RAINFALL ZONES

Eyespot is a fungal disease that occurs in areas with prolonged cool and damp conditions and yield losses can range from minor to extreme, depending on the amount of lodging in the crop.

### KEY POINTS

- Eyespot is a soil and stubble-borne disease with spores produced in autumn and winter.
- Spores can survive in plant stubbles for two years or longer if the stubbles have not broken down.
- Eyespot infection has increased with recent wetter seasons, stubble retention and less burning.
- Eyespot is more likely when frequent rain - even small amounts - received daily over a prolonged period from around mid-tillering to growth stage 30 (GS30).
- Conditions that maintain wet and/or high humidity at the base of the plant contribute to infection.
- Varieties that are taller or have weaker stems will be more prone to lodging after eyespot infection. There may be some variation in susceptibility to eyespot infection in Australian germplasm but this has not been investigated.
- High nitrogen and lush crops are more prone to infection and subsequent lodging losses.

Eyespot is a fungal disease caused by *Oculimacula yallundae* (*Tapesia yallundae*). The fungus infects the lower stems of wheat plants, resulting in stem breakage, lodging, yield loss and high screenings.

The fungus requires rain to splash spores from the stubble and prolonged moisture



PHOTO: HUGH WALLWORK

*Eyespot – named for its eye-shaped lesion at the base of wheat stems – is a fungal disease infecting crops in South Australia's Mid North, Lower Eyre Peninsula and South East as well as Tasmania, Victoria's Western Districts and parts of the New South Wales Riverina.*

or high humidity at the stem base to allow infection to occur. For these reasons, the disease is more prevalent where wheat is grown in medium to high rainfall areas.

Eyespot has been an occasional problem in south-eastern Australia for the past 30 years or more. It was most commonly found where tall wheat varieties were grown for hay and where rotations were short.

Infection has been on the rise in recent years due to shorter rotations, retention of stubbles and because early sowing and increased use of nitrogen has led to denser crop canopies.

In many cases, plants lodge in all directions with each stem falling according to the side where the fungal lesion has weakened the stem. This results in a tangled mass of

plants that are hard to lift during harvest.

If left untreated, eyespot can result in yield losses of more than 50 per cent through damage from lodging, high screenings, smaller grain and grain loss.

Eyespot tends to be more devastating in high production years, where there is more moisture and rainfall during vegetative growth leading up to and around GS30. Yield losses are higher and smaller grains more common in high production years.

### Symptoms

Eyespot gets its name from the eye-shaped lesion that develops at the base of the stem. These lesions weaken the stem which is frequently kinked or broken at the mid-point of the lesion. To see the eyespot clearly,



PHOTO: MICK FAULKNER

Lodging that occurs due to eyespot results in stems laying in random directions, compared with lodging from wind and rain in which stems tend to lay in one direction.



PHOTO: HUGH WALLWORK

Eyespot lesions weaken the stem which is frequently kinked or broken at the mid-point of the lesion. There should also be a sooty mould around the area of stem damage.

strip back the leaf sheath to reveal the bare stem. There should also be a sooty mould around the area of stem damage.

Young eyespot lesions are brown but turn a more bleached white on older stems. Older lesions can surround the entire stem and be up to 4 centimetres long.

The lesion blocks the plant's vascular system, restricting plant growth and grain filling. Lesions also weaken the outer cell walls of the stem.

## Life cycle

The eyespot fungus can survive in plant stubbles for two years or longer if the stubbles have not broken down. Fungal spores produced on the stubbles are rain-splashed over short distances in autumn and winter. Infection of leaf sheaths occurs when moisture levels remain high for extended periods. The early stages of infection cannot be detected visually. Only after six to eight weeks can lesions be detected on stems but by then, it will be too late to avoid yield losses.

The eyespot fungus does have a sexual stage which takes the form of a tiny cup fungus on stubbles. These fruiting bodies produce airborne spores which allow the fungus to spread over long distances. These cup fungi are not easily observed in the field but they help to explain the disease's distribution.

## Risk factors

The key risk factors for eyespot damage include:

- Previous infection in a paddock and the presence of cereal and grass stubbles.
- Receiving frequent rain and long periods of moist conditions to allow spores to spread and infect plants during early growth stages.
- Sowing wheat varieties that are tall and/or have weak stems so they are more likely to lodge when infected.
- Lush crops with closed canopies that keep the base of the plant wet.
- High nitrogen applications are associated with increased disease.

## Variety choice

While useful resistance has been bred into some northern European varieties, it is not currently a priority in Australian breeding programs and resistance has not been assessed. There is anecdotal evidence that some varieties may be more resistant than others although most variation is likely to be related to plant height and straw strength.

Losses have not been detected in durum wheat but research is yet to determine if that is because the crop has some level

of resistance or whether there has been reduced disease pressure because of the rotations used for durums.

## Management

Eyespot is a difficult disease to manage because infection is hard to identify for early treatment. Unlike rust (a communal disease), eyespot is a property-by-property disease. Different rotations, farming practices and environmental conditions can be the difference between infection and healthy crops.

Management must focus on preventative measures. Grain growers need to anticipate how often conditions conducive to eyespot occur on their property. This means the frequency of about 3mm/day of rain for several days in July and early August combined with days where humidity is high at the base of the plant.

## Chemical

There are no chemical options registered for treatment of eyespot in Australia. But the Grains Research and Development Corporation and private industry are funding research into a range of chemical products to determine their activity against eyespot (see back page).

Growth regulants can be used to shorten and strengthen plant stems and thus reduce the risk of infected plants lodging.

## Search for chemical to control eyespot

Identifying fungicides that are suitable for registration to control eyespot has been the focus of a GRDC-funded fast-tracked trial.

The trial was initiated by the GRDC's Medium Rainfall Zone Regional Cropping Solutions Network and undertaken by Agrilink Agricultural Consultants in collaboration with the Mid North High Rainfall Zone farming systems group and Bayer CropScience.

A major finding of the trial was that the timing of application was critical because of the need to treat the disease at the lower stems. After GS30, growth and development can be so rapid that there is too much canopy for fungicides to reach the lower stems.

### Cultural

There are a range of factors influencing the risk of eyespot infection which grain growers can manage including:

- **Stubble:** Modern farming practices involve retaining more standing stubble. Thick stubbles that stand 10 to 20 centimetres in height affect the environment around the base of subsequent crops. Wheat in standing stubbles will have a higher risk of infection. Burning stubbles can reduce inoculum but does not eliminate the disease.
- **Rotation:** Reducing the frequency of growing wheat reduces eyespot infection. Although the fungus can survive in stubbles for two years or more, the amount of inoculum will be reduced with each year out of wheat. While barley has not been observed to lodge, it can be infected and can help fungus survival.
- **Nitrogen timing:** With the development and severity of the disease depending on moisture at the stem base, keeping the canopy open as long as possible can help reduce risk of eyespot infection. This would mean a later rather than early nitrogen application to avoid promoting excessive canopy growth at GS30-32.
- **Seeding rate:** Higher seeding rates tend to create a denser canopy earlier in the season. While it is not a large risk, when added to the other infection factors, it could be a contributor.
- **Time of sowing:** Early sowing tends to create crops with more biomass which increases the risk of eyespot. However, the yield losses in delaying sowing could outweigh the potential losses from eyespot. Other control options should be used in preference.

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## FREQUENTLY ASKED QUESTIONS

### What are the key triggers for eyespot infection?

The key triggers are:

- Growing wheat in close rotation, particularly tall varieties that are more prone to lodging.
- Properties and paddocks that have had eyespot infection are very likely to have it again.
- Conditions that promote long periods of moisture at the stem base, particularly during tillering to GS30.

### How is eyespot identified in a crop?

Visual assessment for the presence of distinctive eyespot shaped lesions and the associated breaking of stems. Lodging that occurs due to eyespot usually results in stems falling in random directions compared with lodging from wind and rain, in which stems tend to fall in one direction.

## MORE INFORMATION

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