

Managing yellow spot and septoria of wheat

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Summary

- Use crop rotation to reduce risk from these stubble-borne diseases.
- Avoid VS or S varieties. Favour MR-MS varieties.
- For wheat grown in rotation, fungicide is more likely to be economic when applied:
 - at or around flag leaf emergence (Z39);
 - in crops having 2.5 t/ha or more yield potential;
 - where there is evidence of increasing leaf spot intensity down the canopy; and
 - when there are good prospects of finishing rains (approximately 100 mm in the two months after flag leaf emergence).
- For wheat after wheat, when there is high disease pressure prior to stem elongation, it may be economic to apply fungicide at early stem elongation (Z31, first node) in crops of 2.0 t/ha or more yield potential. A second spray may be required at or after flag leaf emergence based on the above considerations.
- Control of leaf spot diseases with fungicide in very young crops, prior to early stem elongation (growth stage Z31), is unlikely to be economical.
- Presence of other foliar diseases will enhance returns from fungicide application. Strategies for control of rust diseases with fungicide can vary in important aspects of timing of application.

Leaf spot diseases affecting wheat in Western Australia are septoria nodorum blotch (*Phaeosphaeria nodorum*), yellow spot (*Pyrenophora tritici-repentis*) and septoria tritici blotch (*Mycosphaerella graminicola*). They are caused by three different fungal pathogens but the disease symptoms and biologies are similar.

Leaf spot diseases in wheat appear as irregular or oval-shaped spots that initially are small and often yellow (sometimes blackish-brown), but enlarge to form brown dead centres, with yellow edges. Typically, a badly affected leaf will die back from the tip as lesions merge, reducing the photosynthetic area and causing premature leaf death (for more details refer to Bulletin 4539, *Identifying wheat leaf diseases*).

Septoria nodorum blotch and yellow spot may occur throughout the wheatbelt and frequently occur together. They have the capacity to significantly reduce yield and grain quality in medium-high rainfall areas or other areas receiving above average growing season rainfall. Septoria tritici blotch has become less common throughout the wheatbelt and currently losses from this disease are rare.

Impacts from leaf spot diseases vary greatly from season to season and between locations. They are particularly a problem in continuous wheat crops in stubble retention farming systems. For the most effective control, an integrated disease management approach is required.

Risk factors

Weather

While rotation and variety will influence individual crop risk, the overall risk of serious disease outbreaks is influenced by winter/spring rainfall.

Rainfall information collected at experimental sites between 1997 and 2004 has demonstrated how disease impacts vary with seasonal rainfall.

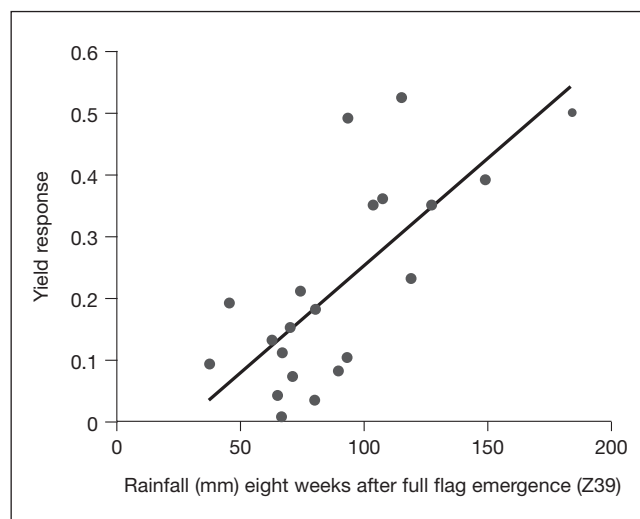


Figure 1. Yield response to a single application of fungicide at flag leaf emergence stage was frequently above 0.2 t/ha when 100 mm or more rain fell in the eight weeks after flag leaf emergence. In a range of experiments with wheat susceptible to yellow spot or septoria nodorum blotch, observed yield response was significantly associated with rainfall after flag emergence

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Experiments indicate that an *economic response to fungicide is more likely when the crop receives approximately 100 mm rainfall or more in the eight weeks following flag leaf emergence* (Figure 1). The likelihood of meeting this criterion is increased for:

- early sown crops, as canopy development is complete by late winter (early flag leaf emergence exposes leaf to more disease).
- high rainfall areas or years of above average seasonal rainfall (Figure 2).

Double wheat cropping

Primary infection of yellow spot and septoria diseases is from infected stubble. These diseases produce over-summering fruiting bodies on stubble that release ascospores with the onset of winter rains. Ascospores of septoria diseases are readily airborne and result in wide dispersal (over kilometres) while those of yellow spot are larger in size and are dispersed over shorter distances (over metres). As they are stubble-borne, these diseases (but particularly yellow spot) will be most serious in continuous wheat cropping under stubble retention systems.

Yield losses

Yield loss will depend on the disease resistance of the variety and the presence and severity of the disease throughout the life of the crop. For susceptible varieties, when the disease development is continuous due to favourable conditions throughout the season, losses around 30 per cent have been measured. When disease development is only favourable for part of the season, either before or after flag leaf emergence, losses around 20 per cent can occur. Severe disease will cause grain quality reductions such as increased screenings and lower hectolitre weights that can add to high yield loss impacts.

Disease management

Utilise variety resistance

Variety is a major influence on which diseases affect your crop. Where disease is likely (high rainfall areas or multiple wheat situations), avoid varieties that are highly susceptible (CVT ratings 2-3) to the commonly occurring diseases. Resistance to one leaf spot disease is independent from another. For the three leaf spot diseases, most varieties respond in the narrow range susceptible to intermediate (partially resistant) (CVT ratings 3-5). Where differences among varieties for resistance are in this range, their response to fungicide control has generally been similar when assessed in experiments. Varieties that are also susceptible to rust

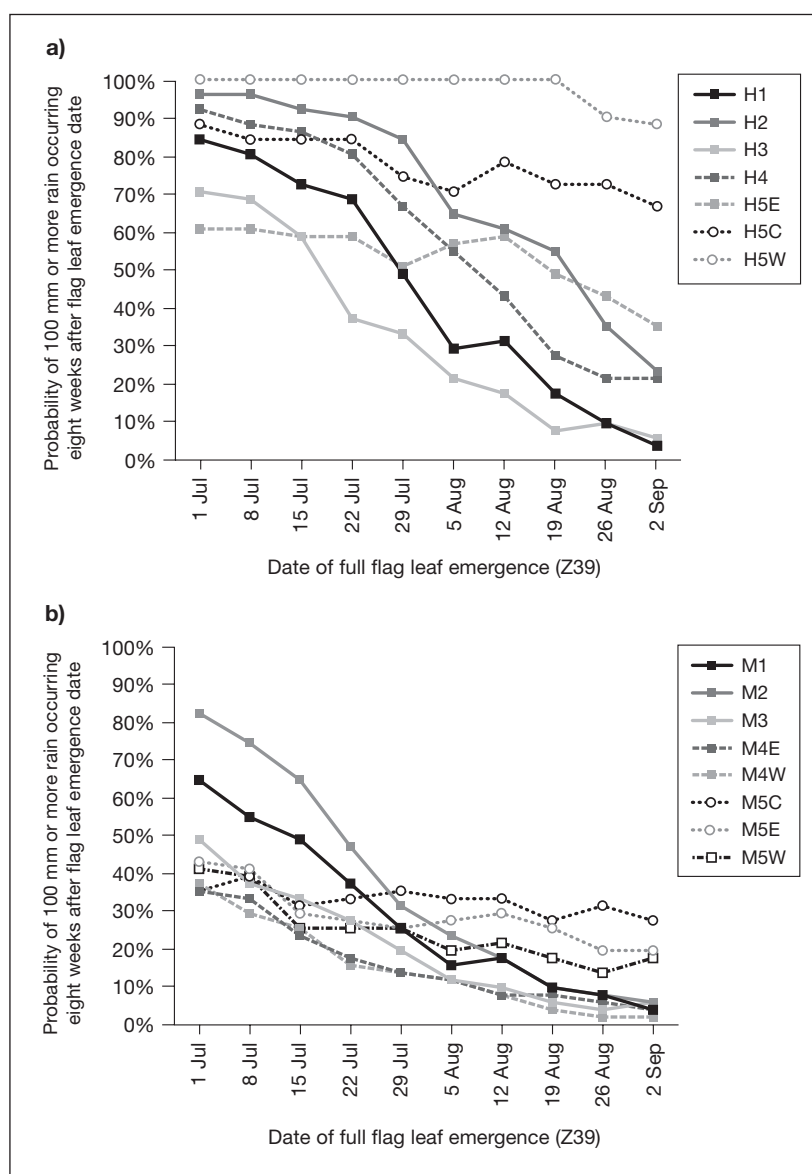


Figure 2. The likelihood of receiving 100 mm or more of rain in the eight weeks after flag leaf emergence for a) high rainfall regions and b) medium rainfall regions (as described in Crop Variety Sowing Guide). Probabilities based on 51 years of rainfall data, 1954–2004 for: a) Northampton (H1), Badgingarra (H2), Beverley (H3), Williams (H4), Munglinup (H5E), Warrup (H5C) and Albany (H5W) and b) Mingenew (M1), Calingiri (M2), Cunderdin (M3), Newdegate (M4E), Kondinin (M4W), Jerramungup (M5C), Scaddan (M5E) and Gnowangerup (M5W). For low rainfall areas the equivalent likelihood over this period ranges from 20 per cent to 0 per cent

diseases are likely to provide larger yield responses from fungicide when rust(s) occur in conjunction with septoria nodorum blotch or yellow spot. Refer to the current *Crop Variety Sowing Guide* for variety resistance ratings.

Avoid early infection by rotating crops

The fungi that cause these diseases survive on wheat stubble very well for six months between continuous wheat crops but relatively poorly after 18 months, such as wheat grown in one-year rotation with other crops or pasture. In addition, normal stubble retention farm practices result in the eventual removal of most surface stubble in one-year rotations by the time the return crop has been sown. For these reasons rotation is highly effective at reducing early disease occurrence in crops while continuous wheat cropping under stubble retention systems results in the highest disease risks.

Use fungicide to control infection in susceptible to intermediate varieties

Some seed treatments can partially control septoria tritici blotch but are generally not used in this context. No seed treatments or in-furrow fungicides are registered for yellow spot or septoria nodorum blotch.

Economic control of septoria and yellow spot diseases with foliar fungicides has been demonstrated in field experiments in well-grown rotation crops (2.5 t/ha or more yield potential). In many situations the most profitable fungicide use is achieved by a single well-timed spray between flag leaf emergence (for example, northern and central agricultural areas) and early head emergence (for example, long season southern agricultural areas). Spraying will be most effective if done before the upper two to three leaves become diseased. At standard rates of application the protection delays disease development by around three weeks.

Control of yellow spot and/or septoria nodorum blotch, assessed in four yield loss experiments, increased yield 0.3 to 0.5 t/ha at yields of 2.6 to 4.1 t/ha, using a single standard rate fungicide application. In a series of 23 other fungicide experiments over five seasons, where diseases such as rust were negligible, a single fungicide application averaged 0.2 t/ha yield increase (range 0–0.5 t/ha), preventing 56 per cent (range 0–100 per cent) of the total yield loss from yellow spot or septoria nodorum blotch, as estimated with multiple fungicide sprays. Yields in these experiments averaged 3.4 t/ha (range 2.3–4.8 t/ha).

Monitoring crops for disease

When considering fungicide use, it is important to ensure that leaf disorders are due to fungal leaf diseases as fungicides will not correct mineral or trace element deficiencies or other disorders such as leaf scorch from chemical or nutrient application.

Differentiation of septoria diseases and yellow spot on the basis of symptoms is difficult. Humid conditions encourage the development of yellow spot and infection depends on leaves remaining wet for more than six hours. The conditions favouring septoria nodorum development are warm weather in association with heavy and frequent rain. Where yellow spot and septoria nodorum blotch are observed in combined infections, similar success in control should be anticipated for both diseases when broad spectrum fungicide (for example, propiconazole) is used.

When wheat is grown after wheat, there is a significant risk that early high levels of leaf spotting disease will establish in the crop, forming a base for the disease to progress rapidly to upper leaves in spring. Inspect the crop at early stem elongation (when the first node is detectable on the main stem, Z31, Figure 3) if the anticipated yield exceeds 2.0 t/ha. If leaf spotting is abundant on many leaves in the canopy, including effects on leaves emerged in the last one to two weeks, an immediate fungicide application can arrest disease development during stem elongation, reducing disease risk later in the season. A follow-up spray may be required around flag leaf emergence (Z39, Figure 3) to prevent disease redeveloping after this stage. Control of leaf spot diseases with fungicide in very young crops, prior to early stem elongation (growth stage Z31) is unlikely to be economical.

- When wheat is grown in rotation and potential yield exceeds 2.5 t/ha, economic responses to fungicide control of leaf spot diseases are possible. Inspect the crop at late stem elongation / early flag leaf emergence (Z37/39, Figure 3).
 - When infection is absent on the top four leaves but symptoms are present on lower leaves, low disease potential exists and economic fungicide responses are only likely at yield potentials of 4 t/ha or more, subject to weather risk factors.

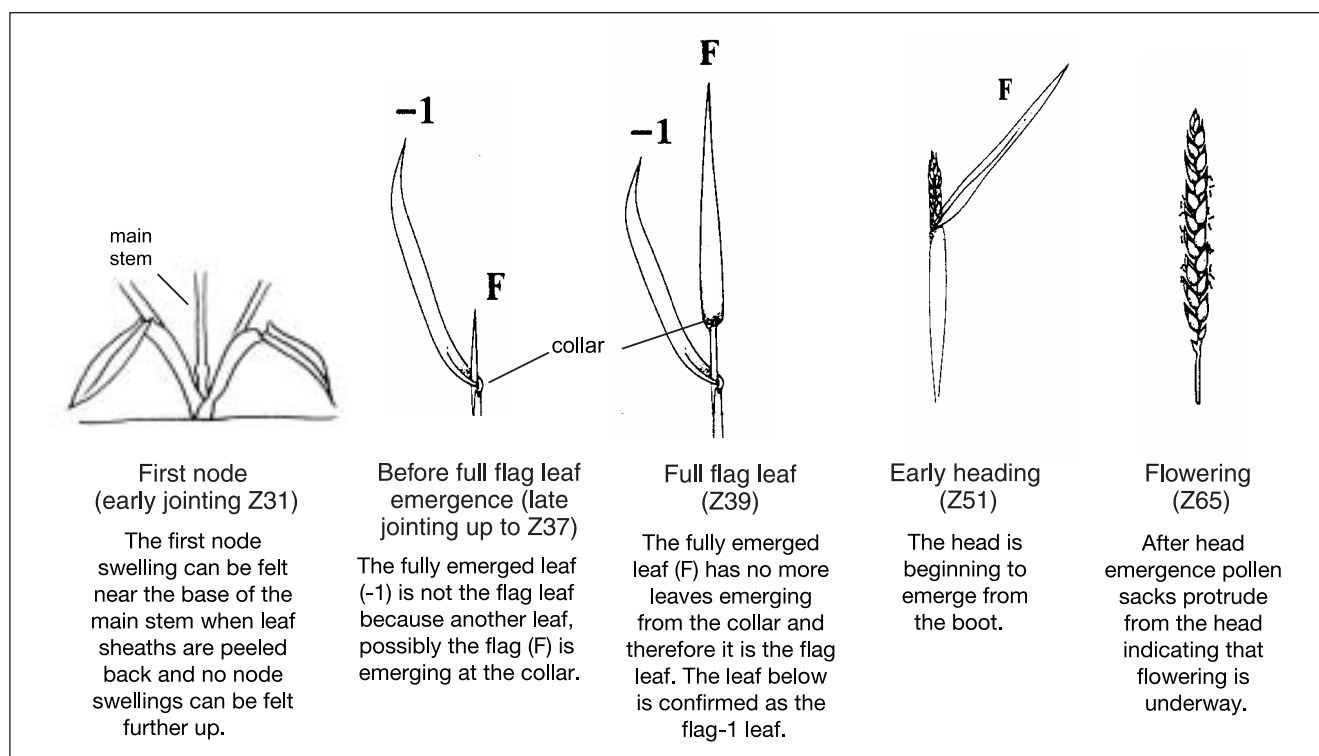


Figure 3. Wheat growth stages (as Zadoks decimal growth stages) in relation to timing fungicide control of yellow spot and septorias.

- When leaf spot diseases are present on any of the top four leaves at 5 per cent leaf area diseased or more, moderate disease potential exists and economic fungicide responses are likely at yield potentials of 2.5 t/ha or more, subject to weather risk factors.

Inspect the crop carefully over a wide area, examining upper and lower leaves for signs of disease. If any rust disease is present or suspected, see relevant Farmnotes under 'Further Reading'. For confirmation on disease diagnosis, send 25 infected stems to AGWEST Plant Laboratories, Department of Agriculture, Locked Bag 4, Bentley Delivery Centre 6983 (ph 08 9368 3721).

Factors in fungicide application

The following factors influence fungicide application decisions (in order of importance):

Rainfall after flag emergence

For fungicide application to be worthwhile there should be a reasonable likelihood of receiving around 100 mm rainfall in the eight weeks after flag leaf emergence as this promotes disease and enables a good crop finish (Figure 2). For further information on rainfall probabilities in relation to time of flag leaf emergence, go to www.agric.wa.gov.au and search for "[Farmnote 59/2005 supplement](#)" including quotation marks.

Timing

- Timing of application is also an important factor in efficient disease control of leaf spot diseases as fungicide activity can be lower than for other diseases.
- Where infection pressures are high early in the season and disease is progressing rapidly, it may be necessary to reduce disease pressure with a fungicide spray at early stem elongation (for example, Z31, Figure 3). A second spray after three weeks or after flag leaf emergence will normally be required.
- Fungicide application to protect the flag and flag-1 leaves should occur at or around full flag leaf emergence (Z39, see Figure 3) and normally before head emergence. Depending on disease levels within the canopy and weather conditions such as rainfall, application can vary from this time by one to two weeks after flag leaf emergence. However, extreme delays (for example, after flowering) should be avoided to reduce the possibility of disease becoming well established in the upper canopy.
- Late onset of disease (particularly septoria nodorum), may warrant a spray prior to flowering (for example, 50 per cent heads emerged: Z55), particularly in long season environments.
- Late spraying is sub-optimal and spraying after crop flowering finishes is generally not economic.

Product

Selection of fungicide can be influenced by opportunities to control other diseases, such as rust, that may occur in the crop. If other diseases are observed, yield

response to fungicide application may be increased over that when only septoria nodorum or yellow spot are present.

Rate

- For yellow spot and septoria control, the standard rate of fungicide is 62 g ai/ha (for example, 250 mL of a 250 g/L formulation). Duration and therefore efficiency of control is reduced markedly at lower rates.
- Use higher rates of fungicide for longer duration of protection, for example, when seasonal conditions favouring infection are likely to persist, for highly susceptible varieties or in long season environments.
- Rate and therefore cost should be tuned to crop yield potential; use standard rates (62 g ai/ha) for crops around 2.5 t/ha. Use a higher rate (125 g of ai/ha) for higher yields (around 3.5 t/ha). Refer to product labels.

Application

- Ground and aerial application methods are equally effective in controlling disease.
- Spray volumes of 50 L/ha in the case of ground spraying and 20 L/ha in the case of aerial spraying are adequate but in high disease conditions, higher spray volumes will be beneficial. Unless specified by the manufacturer, spray adjuvants do not improve fungicide efficiency but follow the manufacturer's advice.

Fungicide control of septoria nodorum head infection

Septoria nodorum blotch, when severe late in the season, can attack wheat heads during grain-fill causing dark patches on the glumes.

It can be expected that head infection will produce shrivelled grain so screenings will be expected to increase with severe infections. It is important to optimise control of septoria nodorum on leaves to reduce risk of infection of heads by applying fungicide at or before crop heading.

Further reading

Bulletin No. 4539 *Identifying wheat leaf diseases*. Department of Agriculture, Western Australia (2001).

Bulletin No. 4655 *The Crop Variety Sowing Guide 2005*. Department of Agriculture, Western Australia (2005).

Farmnote 10/2004 *Cereal Seed Dressing and In-Furrow Fungicides 2004–2005*. Department of Agriculture, Western Australia (2004).

Farmnote 73/2004 *Managing stem rust of wheat*. Department of Agriculture, Western Australia (2004).

Farmnote 43/2005 *Managing stripe and leaf rust of wheat*. Department of Agriculture, Western Australia (2005).