INFECTION TO PROTECTION

NET FORM NET BLOTCH

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This page expands on the key concepts introduced in the 'Infection to Protection-net form net blotch' information sheet, providing further detail on net form net blotch (NFNB), including early symptoms, where to look for these symptoms, recommended monitoring practices and further information on the importance of early detection.

We've provided these additional explanations and supporting information to provide more detail on NFNB, highlighting its relevance to barley production and resources which may be useful in the early growth stage.

Early symptoms

It is important when identifying net form net blotch (NFNB) to ensure that it is not being mistaken for spot form net blotch (SFNB), scald, herbicide damage or physiological spotting.

NFNB is caused by *Pyrenophora teres f. teres (Ptt)*. Symptoms of NFNB appear within 24-48 hours of infection, beginning as dark pin-point spots on the leaves of the host plant. It may take at least 5 days to visually observe symptoms. The pin-point spots develop into distinctive elongated dark-brown necrotic lesions, with the net-like pattern which NFNB is characterised by (Lightfoot & Able, 2010). These lesions can appear on leaves as streaks or blotches and may develop up to several centimetres in length (DPIRD, 2024). As symptoms develop further, they can often be surrounded by chlorosis (Wilson, 2020).

Chlorotic effects develop due to the host plant's hypersensitive reaction whilst necrotic symptoms are caused by cell death in the area where fungal hyphae grow, as *Ptt* is a necrotrophic and toxin producing fungus (Lesiova, et al., 2006).

Symptoms can vary depending on the resistance level of the host plant. Barley varieties with greater resistance often display early symptoms similar to those seen in susceptible varieties, such as small pin-point lesions (Lightfoot & Able, 2010). However, unlike susceptible varieties, these lesions do not elongate over time, typically lacking the characteristic net-like pattern (Lightfoot & Able, 2010). This is due to the genetic resistance slowing the development of the fungus, reducing the impact.

Where to look

Net form net blotch (NFNB) symptoms are found mainly along the leaf blade. As symptoms develop, older lesions elongate along the leaf veins and leaf sheath. Heads can also be affected.

Because the main source of inoculum is infected stubble, primary infections predominantly occur on the lower leaves of the plant (Czembor & Czembor, 2023) . This region of the plant also experiences the highest levels of humidity and moisture, further promoting infection.

Therefore, the first place to look for symptoms is on the lower leaves of a barley crop, this is particularly important if the crop is sown into barley stubble. As the season progresses, rain splash spreads spores upward, and symptoms appear on leaves higher in the canopy, however for early detection the lower canopy is the most important part of the plant to monitor.

When looking for symptoms it is important to consider high risk areas, including:

- Paddocks with barley being grown in successive years
- Crops sown adjacent to or on infected barley stubble
- Crops with varieties which are known to be susceptible
- Areas with a known history of NFNB infection
- Crops grown in potassium deficient soil, as this soil type is more prone to infection (DPIRD, 2024)
- Early sown barley crops
- Areas where conditions are conducive for infection

Timely identification of early symptoms is crucial for crop protection. Increased yield losses are observed when symptoms are present from stem elongation and left uncontrolled, highlighting the importance of early detection during the developmental phase (Czembor & Czembor, 2023).

Monitoring tips

Foliar diseases like NFNB begin developing before symptoms become obvious, therefore monitoring crops early in the season can identify problems and optimise management options. Crops should be regularly assessed for leaf disease to undertake appropriate control measures when first detected.

Some tips for monitoring NFNB include:

- Begin monitoring from emergence to tillering (GS10-GS25) especially after the first extended wet periods.

- Use systematic monitoring processes, for example:

1. At several representative locations across the paddock following a zigzag or W-shaped monitoring pattern.
2. Inspect plants for symptoms of NFNB infection.
3. Assess incidence where disease is present by recording the number of infected plants within the sample and assess severity by estimating the percentage of leaf area affected by NFNB symptoms.
4. This allows for accurate representation of the infection across the paddock and optimisation of targeted treatments (Shivas, et al., 2005).

- Infection can occur in temperatures ranging from 5-25°C with optimum temperatures being 15-22°C. Disease development is favoured by mild weather and frequent rainfall causing extended leaf wetness, making weather monitoring an important tool for disease surveillance. This may influence the frequency of inspections and help indicate when an outbreak may occur.

- A disease scale can help identify how severe the infection is. The scale below (Figure 1) shows the infection response eight days after inoculation (based on Tekauz 1985 scoring scale) and is a good resource for disease scoring (Martin, et al., 2021).

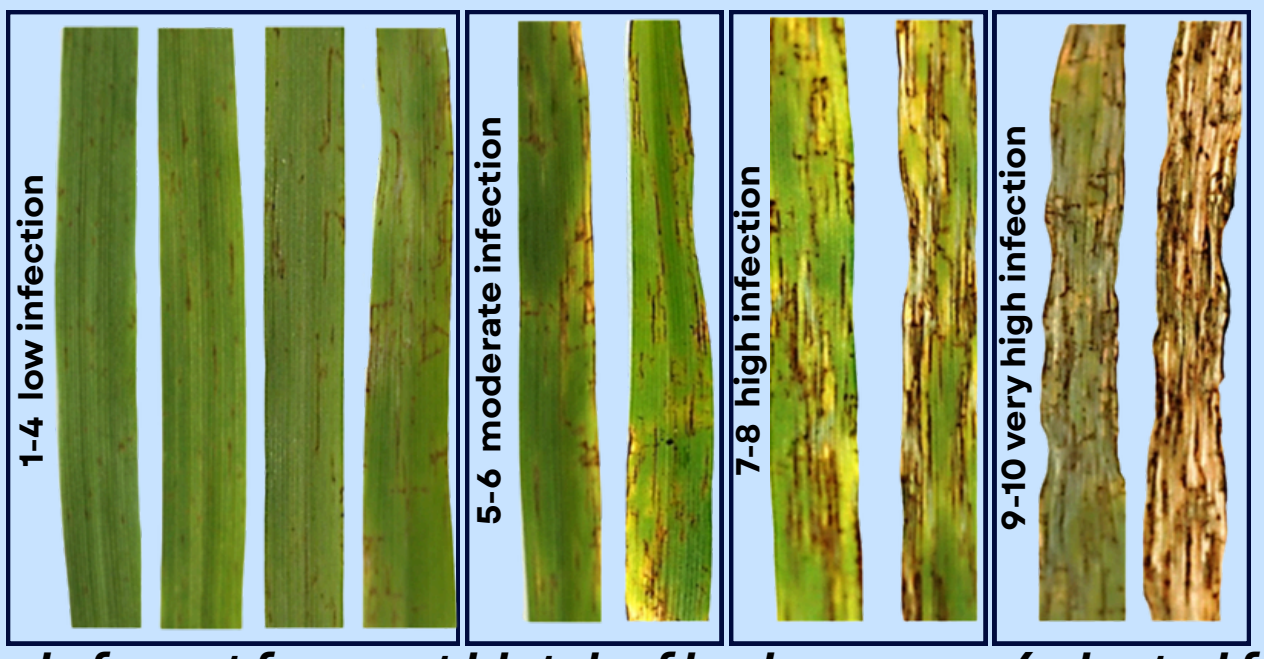

Figure 1. Scale for net form net blotch of barley, scores (adapted from Tekauz 1985 scoring scale).

Why early detection matters

Mitigating the effects of NFNB starts from the beginning; it is important to get on top of infection to prevent high yield losses which may occur later in the season if left untreated. Early detection allows growers to limit progression of the infection and develop management strategies. The prevalence of NFNB is dependent on variety susceptibility and seasonal conditions.

Economic yield loss is most likely when infection reaches the upper canopy, particularly the flag leaf and flag-2 leaf (DPIRD, 2024). Regular crop monitoring throughout the season is essential to identify disease at low infection levels and minimise the infection using recognised control methods.

Foliar fungicides remain one of the primary management tools for controlling NFNB and are most effective when applied preventively, before NFNB becomes well established (Synman & Moore, 2025). Once infection becomes more established, fungicides are less effective at preventing disease spread and protecting yield potential. Therefore, regular monitoring, accurate detection and application of fungicides at the first sign of disease is crucial. With the increasing resistance shown in NFNB, early detection allows for the selection of the correct chemical which can both prevent the application of ineffective products and limit the spread of resistant strains.

All factors considered, NFNB management requires an integrated approach that combines resistant varieties, crop rotation, stubble management, regular monitoring and strategic fungicides use, to minimise both disease impact and resistance development (Synman & Moore, 2025). Although some of these strategies must be implemented prior to detection of NFNB, early identification enables growers to plan for next year and be ahead of infection risk in following seasons.

Additional resources

Advances in understanding the epidemiology, molecular biology and control of net blotch and the net blotch barley interaction
https://www.researchgate.net/publication/361054674_Advances_in_understanding_the_epidemiology_molecular_biology_and_control_of_net_blotch_and_the_net_blotch_barley_interaction

Blotches in barley
https://grdc.com.au/__data/assets/pdf_file/0027/629622/blotches-in-barley-grdc-20251031.pdf

Early season, early signals: Why crop monitoring is crucial
https://groundcover.grdc.com.au/weeds-pests-diseases/biosecurity/early-season,-early-signals-why-crop-monitoring-is-crucial

Net blotch symptoms and management in barley
https://ahdb.org.uk/knowledge-library/net-blotch-symptoms-and-management-in-barley

Wheat and Barley Leaf Symptoms: The back pocket guide
https://grdc.com.au/__data/assets/pdf_file/0024/210696/wheat-barley-leaf-symptoms-the-back-pocket-guide-grdc043.pdf.pdf

GRDC National Variety Trials disease ratings
https://nvt.grdc.com.au/nvt-disease-ratings?crop=Barley&state=SA

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