Department of Agriculture

Farmnote

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Leaf diseases of barley

Farmnote 65/2001

Replaces Farmnote 35/8

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This Farmnote illustrates the leaf diseases occurring in barley grown in Western Australia. Disease symptoms, effects and broad principles for control are discussed. Fungal leaf diseases are the most common and can seriously affect yield. Barley yellow dwarf virus (BYDV) also occurs in aphid prone areas. Some of these diseases are common while others are rare. Other disorders may be caused by nutrient deficiencies or adverse weather conditions.

For specific disease management options refer to Farmnote 64/2001 Managing barley leaf diseases.

Net blotch

Two net blotches occur in Western Australia and can be quite variable in appearance depending on the form of the pathogen, the variety of barley and the stage of infection.

Net-type net blotch, caused by the fungus *Pyrenophora teres* f.sp. *teres*, is the most common form. It occurs throughout barley growing areas of Western Australia. but is more common in the medium and low rainfall areas. Lesions appear on leaves as thin brown streaks or blotches that may enlarge up to several centimetres in length. Darker longitudinal and horizontal lines sometimes develop in the lesions, creating a net like appearance. A narrow zone of yellowing usually surrounds the lesion. Severe infection kills leaves prematurely and mainly causes reduced seed weight. It may also reduce number of ears and number of grains per ear. Yield reductions of 20 to 30 per cent can occur and grain quality (sievings, protein, hectolitre weight) may also be affected.

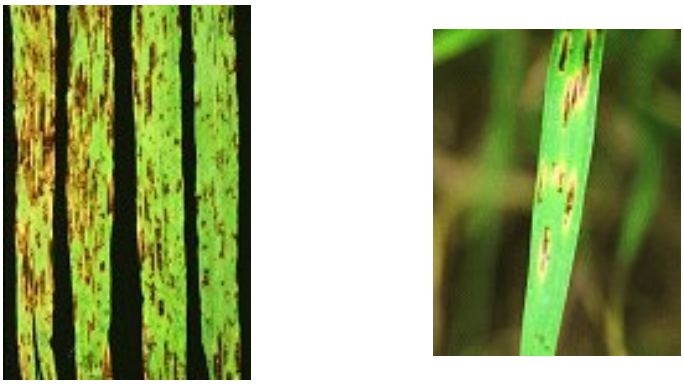

Figure 1 Net type blotch: (left) elongated lesions; (right) lesions with yellow margins.

The fungus is carried from season to season on infected barley stubbles. Spores produced on stubble or straw are spread by wind to initiate infections in new barley crops. Although seed infection levels up to 35 per cent have been observed in Western Australia, significant transmission of seed infection is rare. Infected seed is of minor importance.

Spot-type net blotch (*Pyrenophora teres* f.sp. *maculata*) originally occurred in northern agricultural areas but is now well established in south coastal and adjacent environments of Western Australia. In these areas the disease has increased with the adoption of Franklin and subsequently Gairdner barley varieties, exacerbated by increased stubble retention practices.

Spot-type net blotch has oval, solid brown spots with yellow edges. As infections age they may elongate and join together causing blotch symptoms. Research in the northern and southern agricultural regions has shown yield losses as high as 25 to 32 per cent respectively. The spread and development of the fungus is very similar to net-type net blotch.

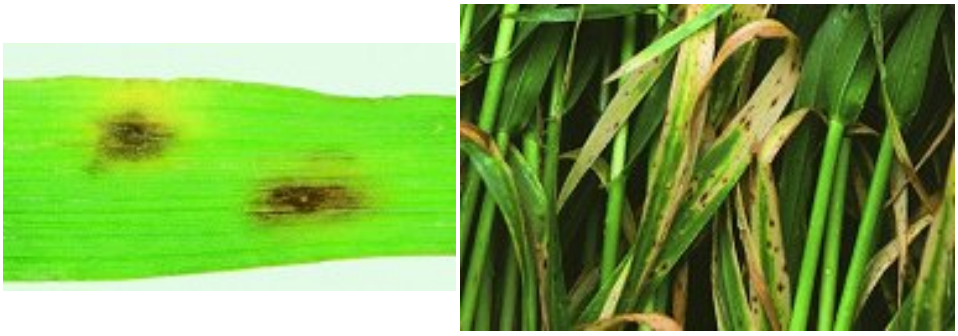

Figure 2. Spot-type blotch: (left) early symptoms; (right) advanced symptoms.

Control

Do not double crop barley in medium to high rainfall areas as this can result in severe disease. In disease prone areas ensure barley is grown only once in three year rotations. Avoid highly susceptible varieties, and in disease prone environments select resistant varieties if available. Seed dressings are ineffective. In high production crops certain fungicide sprays have reduced disease and increased yield and quality. Where the wind erosion risk is low burning stubble will reduce carry-over of the fungus.

Scald

Scald, caused by the fungus *Rhynchosporium secalis*, is a common and widespread disease in Western Australia. Symptoms first appear as oval, grey-green spots on leaves and sheaths but can also occur on the head. The spots become bleached and straw coloured in the centre while the edges remain a distinct dark brown. Entire leaves may be destroyed.

Scald is more common in the southern high rainfall areas but in wet years can be obvious in medium rainfall areas. It is potentially very damaging. Infection kills leaves prematurely and mainly causes reduced seed weight. Severe early infection can reduce numbers of ears and grains per ear. In highly productive crops yield losses up to 45 per cent are possible with associated quality effects.

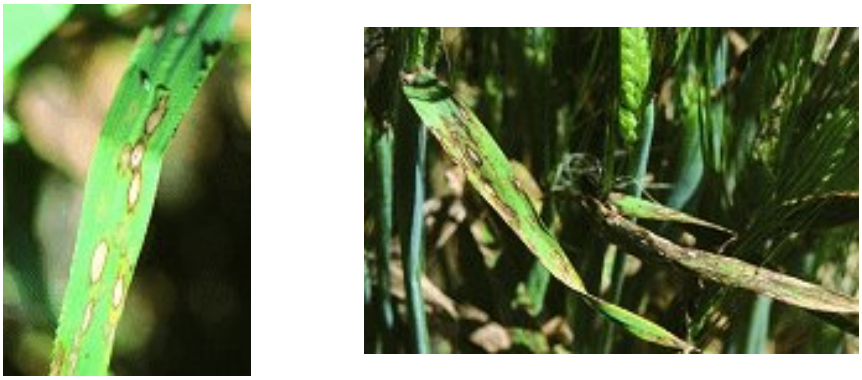

Figure 3. Scald: (left) early symptoms; (right) advanced symptoms.

Infected barley stubbles and infected seeds are the primary sources of infection. Barley grass (*Hordeum leporinum*) is also a host for the scald pathogen and infected barley grass stubble may be a potential source of infection to a new crop. The disease is favoured by cool, humid weather and spreads within a crop by rain splash.

Control

In disease prone environments select resistant varieties if available. On susceptible varieties use a seed applied fungicide with foliar activity or fertiliser applied fungicide to control scald infections early in the season. Foliar fungicides can be used to reduce disease. Do not double crop barley in medium to high rainfall areas as this can result in severe disease unless stubble is destroyed. Where the wind erosion risk is low burning stubble will reduce carry-over of the fungus.

Powdery mildew

The disease is caused by the fungus *Blumeria graminis* f. sp. *hordei* Synonym *Erysiphe graminis* f.sp. *hordei*. The symptoms appear as fluffy white growth on the surface of the leaf. These are colonies of fungal spores. The colonies enlarge and coalesce, producing so many spores that the leaf appears powdery. Infection leads to premature yellowing and later death of the entire leaf.

Powdery mildew is more common in southern regions where high humidity favours disease development. The fungus survives over summer as "black bodies" called cleistothecia on plant residues. With autumn rains, spores are released from these bodies and infect volunteer barley, and spores produced on these plants may be carried by winds a long distance. Airborne spores are likely to be the main source of infection in the barley crop. The disease is most active early in the growing season and normally declines later in the spring. Severe early disease can induce tiller abortion and yield loss is mainly due to reduction in the number of ears. Yield may be reduced between 10 and 25 per cent depending on the severity and duration of mildew infection.

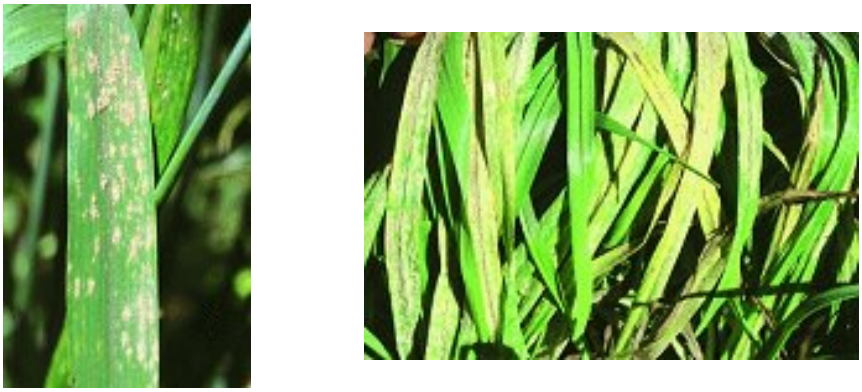

Figure 4. Powdery mildewd: (left) early symptoms; (right) advanced symptoms.

Control

Use resistant varieties if available. Fungicide seed dressings with foliar activity give important protection to young crops (up to eight weeks) which offers the most economical control. However, crops sown with untreated seeds can be protected by spraying with a foliar fungicide. Crop rotation and stubble management are generally ineffective in controlling the disease.

Leaf rust

The fungus *Puccinia hordei* causes the disease. Round, light orange-brown pustules (spore masses) on the leaf are very small and difficult to see. Heavy infection results in early leaf yellowing with green specks around the pustules (so called "green islands"), which may be the most obvious symptom on older leaves. Old pustules turn dark and produce black spores. Look for older black pustules on dying and dead leaves.

Leaf rust has been evident along the south coast since a new strain occurred in 1997. If early infection occurs, yield may be reduced by 30 per cent. Grain quality may also be affected. Losses would normally be less than 10 per cent.

Figure 5. Leaf rust minute red-brown pustules: (left) symptoms; (right) older leaves.

The pathogen needs living barley host plants to survive and self-sown barley acts as a reservoir between cropping seasons. The rust spores are wind borne and may be introduced into a region on wind currents that spread the rust long distances.

Control

Use resistant varieties if available. Appropriate fungicide seed dressings can protect young crops (up to eight

weeks) but most disease normally develops in spring. Spraying with a foliar fungicide can protect infected crops. Crop rotation and stubble management are ineffective in controlling the disease.

Halo spot

The fungus *Pseudoseptoria stomaticola* causes halo spot. The characteristic symptoms are one to four millimetre rectangular lesions with white to light brown centres and purple-brown margins (Fig. 6). Within the lesions tiny dark specks (fruiting bodies) may be evident.

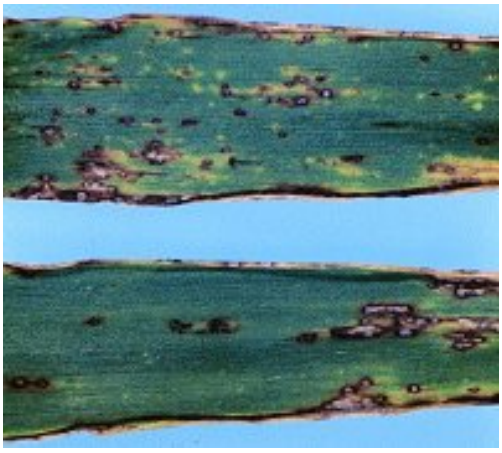

Figure 6. Halo spot

The fungus survives over summer on infected barley stubble and seed. The disease is favoured by cool and moist conditions. High rainfall areas of the south-west are most likely to show the disease.

Control

Most of the recommended varieties have adequate resistance to the disease. Specific control measures are rarely required. Crop management practices recommended for scald control are also effective in control of halo spot.

Ring spot

A fungal disease caused by *Pyrenophora semeniperda*. Infected leaves show small, oval-shaped lesions ringed by a black margin (Fig. 7). The disease primarily affects other grass species, including grasses that commonly occur in naturally regenerated pastures. Barley grown after grassy pastures can show higher levels of disease. Even though leaf spot can be common on young plants, infections diminish after mid season stages (6 to 10 week old crops).

Figure 7. Ring spot

Control

Control measures are not required.

Wirrega blotch

Wirrega blotch is caused by the fungus *Pyrenophora wirreganensis*. The disease is characterised by individual lens shaped blotches light brown in colour. Yellow margins may extend towards the leaf tip. Blotches may have a small hole in the centre (Fig. 8). Like ring spot, the pathogen primarily infects a range of grasses and can be found on paddock and road verges in spring. Leaf infections are rarely severe as spores produced on leaves do not re-infect leaves and so do not increase the disease in crops.

Figure 8. Wirrega blotch

Control

Control measures are not required. Reducing grass populations in paddocks can reduce disease incidence.

Loose smut

A fungus, *Ustilago tritici*, causes loose smut. Infected heads emerge as a mass of dark brown powdery spores. These heads normally stand taller in the crop and spores are blown onto adjacent healthy heads by wind. The bare stalk is left and this may be the only sign of the disease late in the season (Fig. 9). Infected seeds appear healthy but carry a minute dormant infection inside the embryo. Hence the disease is internally seed-borne. Infected plants appear normal until the emergence of the heads. The disease is most common in cool high rainfall areas and may be more common in the year following a wet spring, which promotes seed infection.

Figure 9. Loose smut affected heads (right) with healthy head (left)

Control

Modern seed treated fungicides have the necessary systemic activity required to treat loose smut. Loose smut may be difficult to control so it is vital to apply the correct rate. Seed should not be retained from crops where severe infection (over 5 per cent affected heads) has occurred. Always have new seed treated with fungicide.

Covered smut

Covered smut is caused by the fungus *Ustilago segetum var. hordei*. The heads that emerge are dark in colour and smut balls take the place of the grain (Fig. 10). Unlike loose smut, the smutted heads remain intact until harvest when spores are spread onto the outside healthy seed so the disease is externally seed borne. Covered smut is uncommon unless untreated seed is sown and harvested repeatedly, but it may occur in all barley growing regions. Naked barley is very susceptible to covered smut.

Figure 10. Covered smut.

Control

Fungicide seed treatments readily control covered smut.

Barley yellow dwarf virus (BYDV)

Barley yellow dwarf virus is transmitted by cereal aphids. It is most common in high to very high rainfall south-west and south coastal areas where cereal aphids are prevalent. The virus can occur widely in years of high aphid activity as the virus mainly depends on conditions favourable for early aphid activity and build-up.

Initial infection occurs in very young crops (four to eight weeks) when aphids first arrive. This gives rise to infected individual plants scattered through the crop. From these plants colonising aphids spread the infection to nearby plants causing small, circular patches of yellow stunted plants. Yellowing progresses down the leaf from the tip (Fig. 11). Severely affected plants may be stunted and when the head emerges, awns are twisted and the head may be sterile. Field experiments have shown yield losses of up to 50 per cent in highly susceptible varieties under disease favourable conditions. Losses of 10 to 15 per cent are more typical.

Figure 11. Leaf yellowing typical of barley yellow dwarf virus in barley..

Control

Use resistant varieties if available. If aphids are highly active early in the season use appropriate insecticides such

as synthetic pyrethroids. These kill initial aphid infestations and discourage probing (anti-feed properties) of aphids that may subsequently arrive.

Physiological leaf spotting

Leaf spotting may appear in various forms that may be easily mistaken for spotting symptoms caused by pathogens. Boron toxicity induces a physiological spotting (Fig.12). Causes of some physiological spotting (Fig. 13a, 13b, 13c) are unknown and some varieties are more prone than others.

Figure 12. Boron toxicity

Figure 13a. Physiological spotting

Figure 13b. Physiological spotting

Figure 13c. Physiological spotting

Further reading

- *Managing barley leaf diseases*. Department of Agriculture Western Australia Farmnote 64/01 Agdex 114/633
- *Leaf diseases of barley*. Pp71-77 in The Barley Book (Eds Young, K. and Howes, M.) Department of Agriculture Western Australia Bulletin 4300.
- *Cereal leaf and stem diseases*, 2000. (Ed. H.Wallwork) Published by the Grains Research and Development Corporation.
- *Cereal diseases: The ute guide*. (Ed. H. Wallwork) Published by Primary Industries, South Australia and available from the Grains Research and Development Corporation through TOPCROP Australia.

Acknowledgements

Figure 10 was provided by Dr Hugh Wallwork, South Australian Research and Development Institute (SARDI). Figures 12, 13a and 13c were provided by Ms Ros Jettner and Figure 13b was provided by Mr Kevin Young, Department of Agriculture Western Australia.

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