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BARLEY DISEASES IN WESTERN AUSTRALIA

By W. A. SHIPTON* and W. R. TWEEDIE, Plant Pathologists

Photography by K. J. LOCKE

BARLEY DISEASES caused by pathogenic organisms are capable of reducing yields considerably. The recognition of disease is important so that control measures can then be taken at the appropriate time.

In this article the diseases of barley caused by pathogenic organisms are described and illustrated, and where possible, the control measures are given.

Net blotch
Net blotch, caused by the fungus Pyrenophora teres Drechs., is a common disease of barley and can reduce yields substantially.

The disease is first apparent on the leaves and leaf sheaths as light to yellowish green spots. These spots soon turn brown. Darker areas appear in the blotches and extend to the leaf axis, giving the lesion a distinctly netted appearance (Fig. 1). Infection of the head occurs as a light to dark brown discoloration, and the spots may have a netted appearance. Grain infection is characterised by a light brown localised discoloration.

The organism apparently persists in infected plant debris and on volunteer barley and susceptible grasses.

Control
The use of resistant varieties is the only effective means of control, but none are yet available. Some measure of control can be obtained by dusting the grain with an organic mercury dust, by destroying infected barley and grass straw by burning and by rotating barley crops with wheat, oats, or legumes.

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Fig. 1.—Net blotch

Fig. 2.—Scald

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Scald

Scald is another common and sometimes serious disease and is caused by the fungus *Rhynchosporium secalis* (Oudem.) J. J. Davis.

The disease first occurs as spots but these quickly develop as water soaked areas of irregular shape on the leaves, stems, and heads. The blotches are greyish green and develop a distinct brown margin; finally the lesions assume a bleached straw colour with brown margins (Fig. 2). The disease causes premature foliage death.

The organism apparently persists in infected crop debris and on volunteer barley.

Control

The same control measures as suggested for net blotch should be used.

The variety Atlas 57 appears to have a degree of resistance, at least in some localities.

Stripe

Stripe is a rare disease caused by the fungus *Pyrenophora graminea* Ito & Kuribay.

The fungus causes a yellow striping of the leaves and leaf sheaths. The yellow areas soon turn brown (Fig. 3).

The disease can be carried over in infected straw and seed. It is likely that the persistence of the organism in infected debris is the main, and possibly the only manner of carry-over here.
Control
The same control measures as suggested for net blotch should be used.

Stem rust
The fungus which causes stem rust of wheat (*Puccinia graminis tritici* Erikss & Henn.) is also capable of infecting barley. The disease is rarely serious on barley.

On a fully susceptible host the disease is evident as elongated reddish-brown pustules (Fig. 4) on leaves, stems, and heads. The pustules are surrounded by a light green area. The powdery spore masses contained in the pustules can be dislodged readily.

Control
Control measures would not appear to be necessary at present. The use of resistant varieties would be the only adequate means of control.

Powdery mildew
This disease, although fairly common, is not usually serious in the main barley growing districts. It is caused by the fungus *Erysiphe graminis* DC.

Infection is evident on the leaves, stems, and heads as a whitish, powdery growth. Initially the infected tissues are pale but later turn dark brown (Fig. 5). The powdery fungal growth turns greyish with age and may become dotted with black fruiting bodies of the fungus (Fig. 6).
The only practical method of control would be through the use of resistant varieties. However, none are available at present.

**Covered smut**

This rather uncommon disease is caused by the fungus *Ustilago hordei* (Pers.) Lagerh.

Infected heads contain no grain; instead the grain is replaced by a powdery spore mass enclosed by a rather persistent membrane. Infected heads have a greyish white and finally a black appearance (Fig. 7). The membrane enclosing the spore mass ruptures during harvesting and the spores contaminate the healthy grain. Seedlings are infected soon after seed germination. Infection occurs from spores carried on the seed. It is not certain whether soil infection occurs in Western Australia.

**Control**

Covered smut may be controlled on the seed by the use of organic mercury dusts.

**Loose smut**

The organism causing loose smut is the fungus *Ustilago nuda* (Jens.) Rostr. The disease is becoming more common and is sometimes serious.

Smutted spikes arise from the boot earlier than healthy ones. No grain is present in the affected heads. A black spore mass replaces the floral bracts and ovaries and is enclosed by a delicate membrane. The membrane ruptures soon after the spikes emerge, and thus at harvest the spikes are more or less bare (Fig. 8). The smut spores infect the healthy ears about the time of flowering and the fungus becomes established in the grain, where it remains dormant until the grain germinates.

There is no carry-over of the disease in the soil.
Control
Seed dusting is ineffective. Clean seed must be obtained from a disease-free crop.

Leaf spot
The fungus which causes leaf spot is Drechslera verticillata (O'Gara) Shoemaker. The disease is apparently widespread.

Infection of the leaf is characterised by the occurrence of relatively small oval-shaped spots with light brown centres and dark brown to black margins (Fig. 9). Seed infection may also occur.

Relatively little is known about the disease and no control measures are available.

Yellow dwarf virus
Yellow dwarf is caused by an aphid-transmitted virus. It is not common in the main cereal areas.

The disease is characterised by the development of golden yellow colour from the leaf tip through the entire leaf blade. Dark green stripes extend into the yellow portion of the leaf in the transition zone between green and yellow. A diagnostic feature of the disease is that emerging leaves are golden yellow (Fig. 10). Early infection of plants leads to extreme stunting, excessive tillering, and limited or no spike development. Late infection results in limited spike development, infertile florets, reduced kernel formation, and poorly filled grain.

Control
The use of resistant varieties is the only economical means of control. At present no resistant varieties can be recommended.

Take-all
Take-all of barley is widespread and is caused by the fungus Ophiobolus graminis Sacc. Barley is less susceptible to the disease than wheat.

The disease tends to occur in patches. Affected plants die prematurely. Diseased plants may be stunted, and heads contain little or no grain. The roots and crown region are dry, rotten, and discoloured. Removal of the leaf sheath at the base of the plant reveals black streaks or spots which may encircle the stem (Fig. 11).

Control
Multiple cropping is unwise as the disease is likely to increase. Barley should be rotated with oats, linseed, or legumes. Control of weeds and grasses must be maintained in crops and pastures. Stubble burning, the application of adequate fertilisers, including the correction of any nutritional deficiencies, and showing seed at the recommended rate will aid in disease control.

Foot rot
Foot rot of barley occurs widely but is apparently less important than take-all. It is caused by the fungi Fusarium culmorum (W. G. Smith) Sacc., Helminthosporium sativum Pamm., King, and Bakke, and Rhizoctonia solani Kühn.

Symptoms of foot rot are similar to those caused by take-all. However, the basal stem discoloration is not black but varies from light-brown to dark-brown (Fig. 12).

Control
The same control measures as suggested for take-all should be used. The seed should be dusted with an organic mercury dust to control seed-borne infection.
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