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OAT DISEASES IN WESTERN AUSTRALIA

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

OVER ONE MILLION acres of oats are grown yearly in this State, making the crop next in importance to wheat. Pathogenic organisms are responsible for considerable reductions in yield, yet losses can be minimized if control measures are taken.

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

Septoria leaf spot

*Septoria* leaf spot is the most common, and undoubtedly the most important, oat disease in this State. It is caused by the fungus *Leptosphaeria avenaria* G. F. Weber (*Septoria avenae* Frank) but should not be confused with the *Septoria* diseases of wheat which are caused by different organisms.

The organism infects the leaves, sheaths, stems, and heads. Disease lesions on the leaves are purplish-brown initially and on enlargement have brown centres and sometimes yellowish-orange margins (Fig. 1). Diseased areas on the sheaths and stems may be extensive and black (Fig. 2). Severely affected plants tend to lodge.

The fungus causes a dark discolouration of the grain (Fig. 3).

Infected plant debris is the main source of carry-over of the disease. It may also be transmitted by seed.

Control

Stubble from diseased plants should be destroyed by burning or ploughing in. If possible oats should be grown in areas well separated from those sown to oats in the previous season.

The grain should be dusted with an organic mercury dust at 2 oz. per bushel to control seed-borne infection.

Rusts

Two rusts, namely, crown and stem rust are found on oats. In some seasons the diseases are widespread and may cause substantial losses. The relative importance of each rust is, however, unknown.
Rain discolouration by Septoria avenae

Crown rust

The causal organism of crown rust is the fungus *Puccinia coronata* Corda var. *avenae* Fraser & Led. The development of round to oblong, orange to yellow pustules on leaves, stems and heads is characteristic (Fig. 4). The powdery spore masses contained in the pustules are readily dislodged. The pustule areas turn black with age.

The organism is apparently carried-over from season to season on volunteer oats and on certain grasses.

**Control**

The most satisfactory way to control the disease would be through the use of resistant varieties. The present commercial varieties appear to have a degree of resistance to crown rust (race 237).

Stem rust

Stem rust is caused by the fungus *Puccinia graminis* Pers. var. *avenae* Erikss. & Henn. Disease symptoms are similar to those produced by crown rust except that the pustules are reddish-brown. Carry-over of the disease is as for crown rust.

**Control**

Again the most satisfactory way to control the disease is through the use of resistant varieties. Unfortunately, all the recommended oat varieties are susceptible to stem rust (race 2).

Smuts

Two diseases caused by smuts occur, but both are of relatively minor importance.

Loose smut

The fungus *Ustilago avenae* (Pers.) Rost. is responsible for the disease called loose smut. Diseased heads do not contain grain. The flowers are largely replaced by a black spore mass which is covered by a delicate membrane (Fig. 5). This membrane readily ruptures and the spores that are released contaminate the healthy grain. The spores carried on the grain germinate and infect the young seedlings.

**Control**

The disease may be controlled by treating infected seed with an organic mercury dust at 2 oz. per bushel.

Covered smut

The fungus *Ustilago kolleri* Wille is responsible for covered smut. The symptoms are similar to those caused by loose smut, but less conspicuous. The membrane enclosing the spore mass is not so fragile and generally remains intact until harvesting (Fig. 6). Spores released at harvesting contaminate healthy grain. These spores germinate and infect the seedlings.

**Control**

The same measure recommended for the control of loose smut is effective for the control of covered smut.

Take-all

Take-all is caused by the fungus *Ophiobolus graminis* var. *avenae* Turner. The disease occurs mainly in the south west oat growing areas, and appears to be of little significance at present.
Affected plants may be stunted and die prematurely, consequently they produce little grain. The disease tends to affect plants in patches. The roots and basal stem region of affected plants are discoloured and show a dry rot. Removal of the leaf sheath at the base of the stem reveals a dark brown to black lesion which may encircle the stem (Fig. 7).

**Control**

Crop rotation using legumes gives effective control if the incidence of weeds and grasses is low. Multiple cropping to oats will lead to an increase in the severity of the disease. The fungus is able to infect wheat and barley and therefore these crops should not be used in a rotation with oats. It differs in this respect from the common take-all fungus of wheat and barley which does not attack oats. Stubble burning, the application of adequate fertilisers, and sowing seed at the recommended rate will aid in control.

**Leaf spot**

Leaf spot is a fairly common disease and is caused by the fungus *Drechslera verticillata* (O'Gara) Shoemaker. The fungus infects the leaves and leaf sheaths causing small purplish-black spots, which on enlargement develop bleached centres (Fig. 8). The symptoms caused by the disease are similar to, and easily confused with those caused by *Septoria*. The fungus
Leaf Spot may be seed-borne, and is possibly soil-borne, but is capable of infecting many grasses and other cereals.

**Control**
Little is known about the disease and no control measures are available.

**Powdery mildew**
This rare disease is caused by the fungus *Erysiphe graminis avenae* E. Marchal.
Infection of the leaf, sheaths, and heads is evident as a white to light grey, powdery growth which darkens with age. The infected tissues, although yellow at first, eventually turn brown.

**Control**
Control measures are not necessary, but would ideally consist of the use of resistant varieties.

**Yellow dwarf**
The virus causing the disease is aphid-transmitted. The disease appears to be of some importance in the wetter south west areas.
Infected plants may be severely stunted, but this depends on the stage when they are infected. Early infection leads to dwarising, whereas late infection leads to limited spike development and blasting of florets. Leaves emerging after infection may be white to yellow (Fig. 9), whereas expanded leaves show yellow blotches which turn pink and then red (Fig. 10).
Grasses act as alternate hosts of the disease.

**Cereal root nematode**
The disease caused by the nematode *Heterodera avenae* Wollenweber has been detected in the Geraldton-Northampton districts. Heavy infection can cause a severe reduction in yield.
Affected plants are stunted and unthrifty, and sometimes the leaves are tinged red or reddish-purple. The roots are short, thickened, and excessively branched. They carry gall-like formations (Fig. 11).

Control

Oats should not be sown on infected areas. The introduction of legume pastures into rotations will reduce the nematode population and enable eventual economic cropping with other cereals to be carried out. Multiple cropping to cereals should not be practised. A fuller account of cereal eelworm disease is given in Bulletin No. 3561.

Other Diseases

A number of diseases have been recorded on oats, but have not been found for a number of years. These include: halo blight (*Pseudomonas coronafaciens* (Elliot) Stevens), *Fusarium* blight (*Fusarium* sp.), damping-off (*Rhizoctonia solani* Kühn), dry blotch (*Scolecotrichum graminis* var. *avenae* Erikss.), *Helminthosporium* leaf spot (*Pyrenophora avenae* Ito & Kuribay), *Helminthosporium* blight (*Helminthosporium victoriae* Meehan & Murphy), black mould (*Mycosphaerella tulasnei* (Jancz.) Lindau), and stem and bulb eelworm (*Ditylenchus dipsaci* (Kühn) (Filipjev).

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