DESCRIPTION AND KEY TO OAT DISEASES IN NEW ZEALAND

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KEY

LEAF AND STEM DISEASES

1. Numerous round to oblong orange-yellow pustules. Also on the leaf sheath at maturity of the plant in association with small black pustules.
Crown Rust (*Puccinia coronata* Corda var. *avenae* Fraser & Led)
2. Oblong reddish-brown to dark-brown pustules. Mainly on the leaf sheath and stem.
Stem Rust (*Puccinia graminis* Pers. var. *avenae* Eriks & Henn)
3. Irregular blotching of the leaves.
 - (i) Irregular to linear, with a reddish-brown to purple margin. Frequently with sunken centre.
Helminthosporium Leaf Blotch (*Helminthosporium avenae* Eidam. Perfect state *Pyrenophora avenae* Ito & Kuribay)
 - (ii) Well defined lesion with grey centre and dark-brown margin.
Septoria Leaf Spot (*Septoria avenae* Frank. Perfect state *Leptosphaeria avenaria* Weber)
 - (iii) Light-green to grey irregular to oblong flecks, later enlarge, dry out and change to buff or light-brown.
Dry Leaf Spot (Manganese deficiency)
4. Reddening and yellowing of the leaves, and a general stunting of the plants. Infected plants in patches.
Barley Yellow Dwarf Virus (BYDV)

STEM BASE INFECTION

5. Lens shaped areas surrounded by darker margin.
Eyespot (*Pseudocercosporella herpotrichoides* (Fron.) Deighton)
6. General browning of the stem base.
 - (i) Mat of coarse, dark-brown to black mycelium around the stem base. Hypocotyl dark-brown to black. Associated with rapid bleaching of the plant and white heads.
Take-all (*Gaeumannomyces graminis* (Sacc.) v. Arx & Oliver)
 - (ii) General browning of the stem base without the mat of dark-brown to black mycelium, or scattered small brown lesions on the roots, more commonly near the stem base.
Fusarium Foot-rot (*Fusarium* spp.)

HEAD DISEASES

7. White Heads.
 - (i) Associated with dark-brown to black mycelium and browning of stem base.
Take-all (*G. graminis*)

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- (ii) Associated with general browning of the stem base but not the mat of dark-brown mycelium.
Fusarium Foot-rot (*Fusarium* spp.)
 - (iii) Partial whitening as a result of sterility in a number of successive spikelets which have failed to develop. Most noticeable when confined to the terminal spikelets.
Frost Damage
 - (iv) Partial whitening (blast) in a number of successive spikelets. Associated with reddening and yellowing of the leaves and stunting.
Barley Yellow Dwarf Virus (BYDV)
8. Black spore masses replacing the floral parts. Most conspicuous just prior to flowering.
- (i) Spore masses retained inside an outer membrane.
Covered Smut (*Ustilago hordei* (Pers.) Lagerh)
 - (ii) Black powdery spore masses not retained within an outer membrane.
Loose Smut (*Ustilago avenae* (Pers.) Rostr.)

BARLEY YELLOW DWARF VIRUS (BYDV)

Symptoms vary greatly with the age of the plants at infection. The disease is most noticeable at the seedling stage during the winter, when infected plants become stunted and bright red or yellow. The degree of dwarfing depends upon the stage of plant development when infection occurs. With plants infected between tillering and 'shooting' the only noticeable symptoms are a general stunting and a premature bright yellow or reddish discoloration at the tip of the fully grown leaves. At harvest, partial whitening of a number or all of the heads (blast) can occur.

COVERED SMUT

Ustilago hordei (Pers.) Lagerh

Covered smut is more difficult to detect at flowering as the mass of black spores are retained within a fairly permanent membrane composed of the pericarp and floral bracts. As the head ripens this membrane may break down exposing the spore mass, at which stage the disease looks similar to loose smut. The smut balls are broken during ripening and harvesting, releasing the spores over the surface of the healthy grain. Infection takes place during germination.

CROWN RUST

Puccinia coronata Corda var. *avenae* Fraser & Led.

Crown rust or leaf rust appears to be one of the important diseases of oats in New Zealand. The orange-yellow pustules develop on the leaves and leaf sheath. They are round or oblong but soon spread and coalesce to form irregular patterns. Crown rust is distinguished from stem rust by the orange-yellow spore masses, not dark-brown, nor is the epidermis of the host turned black as in stem rust. Heavy infections at the seedling stage will cause severe yellowing and retarded growth. Later infections will cause early maturity and stem break.

DRY LEAF SPOT

Manganese deficiency

This disease is common throughout New Zealand and is frequently confused with *Helminthosporium* leaf blotch. The best method of distinguishing these two disorders is to assess the distribution within the crop.

Dry leaf spot symptoms are most likely to occur at a similar level on all plants, while *Helminthosporium* leaf blotch symptoms would vary in severity from plant to plant. Early symptoms are light-green to grey irregular to oblong flecks on the leaves. These areas enlarge dry out and change to a buff or light-brown colour.

EYESPOT

Pseudocercospora herpotrichoides (Fron)

Although eyespot has little effect on oats in New Zealand, it is important in that it maintains the inoculum in the soil. If wheat were to follow oats, greater yield losses may occur due to eyespot than would normally be expected from a first year crop.

Eyespot lesions are elliptical or oval with light-brown straw-coloured centres and light-brown margins. Similar lesions occur on the culm beneath the leaf sheath. A black "pupil" can be formed by the mycelial mat in the necrotic area of the lesion.

FUSARIUM FOOT-ROT

Fusarium nivale (Fr.) Ces. Perfect state *Micronectriella nivalis* (Schaffn.) Booth

F. avenaceum (Fr.) Sacc. Perfect state *Giberella avenacea* Cook.

F. culmorum (W. E. Small) Sacc.

F. graminearum Schw. Perfect state *G. zeae* (Schw) Petch.

The four species of *Fusarium* are widespread in the soil, causing both pre- and post-emergent death of seedlings. Infection of seedlings results in brownish lesions at the base of the coleoptile or on the roots, usually in the vicinity of the crown. Symptoms on the mature plants are a general browning of the stem base associated with stunting and white heads if the plants have been subject to severe water stress during the growing season.

HELMINTHOSPORIUM LEAF BLOTCH

Helminthosporium avenae Eidam. Perfect state *Pyrenophora avenae* Ito & Kuribay

The disease is found throughout New Zealand though usually at low levels. It is seed borne and infected seedling can be found scattered through a crop at the 2-3 leaf stage. Lesions are oblong to linear with irregular margins. They are light reddish-brown, frequently with a sunken centre, and conidia are fairly abundant on the older portions of the blotch. The infected leaf blades turn yellow and dry out as the infection advances.

LOOSE SMUT

Ustilago avenae (Pers.) Rostr.

Loose smut has been on the increase since the mercurial seed treating chemicals were removed from the market. In recent years infestations as high as 10% and 12% have been recorded.

Loose smut infection replaces all the floral structures, except the rachilla. By flowering the whole head has taken on the sooty appearance characteristic of this disease. Unlike loose smut of wheat and barley loose smut of oats is carried on the outside of the seed and infection takes place at germination.

Cereal Diseases

SEPTORIA LEAF SPOT

Septoria avenae Frank. Perfect state *Leptosphaeria avenaria* Weber

Septoria leaf spot appears to be of little importance in New Zealand. Lesions are well defined with grey centre and dark-brown margin, and may extend onto the leaf sheath or culm, resulting in necrosis and blackening. Infected plant debris and stubble are the main sources of carry-over of the disease. It may also be seed borne.

STEM RUST

Puccinia graminis Pers. var. *avenae* Eriks & Henn

Unlike leaf rust which is widespread each year, stem rust rarely reaches epidemic proportions mainly due to the oat varieties presently being grown in New Zealand.

Though occasionally on the leaves and floral bracts, the pustules of the uredial stage occur mainly on the leaf sheath and culm. The uredia are reddish-brown in colour, usually oblong, with the epidermis still present though pushed back away from the pustules in flakes. The black telio-spores develop on the leaf sheath and culm just prior to the maturation of the plant.

TAKE-ALL

Gaeumannomyces graminis (Sacc.) v. Arx & Oliver
(= *Ophiobolus graminis* (Sacc.) Sacc.)

Symptoms on oats are similar to those of wheat though normally to a lesser degree. Infected plants lose their green colour before maturity becoming bleached and slightly stunted. The crown and basal culm tissue of such plants exhibit a dry rot accompanied by a dark-brown mat of coarse mycelium. This fungal mat is especially conspicuous under the leaf sheath.

This disease is of minor importance in reducing yields of oats as this crop has a high degree of tolerance to take-all. However, the disease is carried over on oat crop residues. Growing wheat after successive oat or barley crops can lead to severe crop losses and even to complete crop failures.