DISEASES OF LUCERNE IN NEW ZEALAND

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THE DISEASES of lucerne in New Zealand have been reviewed (Close, 1967). This paper presents information on two new diseases (pepper spot and bacterial wilt) and additional data on some other diseases.

FUNGAL DISEASES

CROWN WART (*Physoderma alfalfae* (Lage) Karling)

This is more widespread than was originally realized, being found on lucerne plants from Rotorua, Gisborne, Marlborough, three more sites in Canterbury, and in North Otago. The disease appeared to be severe and causing damage at the Gisborne location. It is likely that this disease could be more important in wetter or low-lying areas.

SEEDLING DISORDERS

In Canterbury, lucerne seedlings are often found showing premature yellowing of the cotyledons and retarded growth. In some cases *Pythium* spp. were isolated from them, but species of *Fusarium* were more often present, namely, *F. avenaceum* (Corda ex Fr.) Sacc., *F. oxysporum* Schlecht and *F. sambucinum* Fuckel var. *coeruleum* Wollenw. Tests are in progress to determine pathogenicity. Results to date indicate that *F. avenaceum* can cause death or retarded growth of infected plants, leaf infection and stem lesions of seedlings and more mature plants; *F. oxysporum* appears to cause wilting of plants.

In a study of pre- and post-emergence damping-off in lucerne, Chi and Hanson (1962) showed that the age of seedlings at time of inoculation had a greater effect on their susceptibility to *Pythium* disease than the type of soil, soil moisture or soil temperature. After 2 weeks, seedlings became relatively resistant to *Pythium*. The effect of *Fusarium* species was studied by Chi *et al.* (1964). Most seedlings became infected at an early age and the amount of damage was related to factors that weakened the host and predisposed it to attack by these fungi.

The use of fungicidal seed treatment of lucerne has to be evaluated. Trials have indicated that benomyl, choroneb or thiram can be used with coated seed, and no adverse effect on nodulation has been noticed.

DOWNY MILDEW (*Peronospora trifoliorum* DBy)

This is known to be present throughout New Zealand causing disease symptoms in spring and early summer. Varieties differ in their susceptibility—Mesilla has been seen to be more susceptible than Wairau.

SPRING BLACK STEM AND LEAF SPOT (*Phoma medicaginis* Malbr. and Roum. (*Ascochyta imperfecta* Peck))

This pathogen was found in most seed lines examined in the Plant Diseases Division laboratory at Lincoln. The incidence varied greatly but

some lines had over 40% infected seed. It is anticipated that benomyl as a seed treatment may effectively control the seed-borne phase of this disease.

Of interest is a report (Sherwood *et al.*, 1970) that lucerne plants infected with this fungus can accumulate the flavonoid phyto-oestrogen, coumestrol, which can have an adverse effect on the fertility of sheep. The diseases anthracnose and rust also were shown to induce coumestrol accumulation in lucerne, and reference is made to a further three pathogens, common leaf spot, pepper spot and *Stemphylium* leaf spot, which similarly induce accumulation.

LEAF RUST (*Uromyces striatus* Schroet.)

This causes small (1 to 2 mm) reddish pustules on leaves particularly on crops allowed to mature or being saved for seed. It has recently been seen in samples from Marlborough, Lincoln, and mid-Canterbury. These observations indicate that Wairau is susceptible but there may be differences between individual plants.

VERTICILLIUM WILT (*Verticillium albo-atrum* Reinke and Berthold)

Plants infected with this disease have either been found in or received from Wairakei, Gisborne, Hastings, Feilding, Blenheim, Canterbury (various stands), north and south Otago. In most cases, infected plants were scattered throughout stands. Isolates of the fungus have been shown to be pathogenic in the glasshouse causing yellowing of individual leaflets or of the whole leaf, followed later by bleaching of leaves. Wilting was obvious when plants were under moisture stress. Infected plants were only slightly stunted; there was no tendency towards stem proliferation.

In all cases, *V. albo-atrum* was identified as the causal organism, *V. dahliae* was not detected. Further work is needed to determine whether there are differences between the lucerne strains of *V. albo-atrum* and those from other hosts.

PEPPER SPOT (OR BURN) (*Leptosphaerulina trifolii* (Rost.) Petr.)

This was first recorded on lucerne in New Zealand in January, 1969, in the Putaruru area. Since then it has been found at Murupara, Hastings, and in mid-Canterbury. On leaves of affected plants there are numerous, light-brown, sunken lesions with a darker rim. Within the lesion there are small immersed perithecia. The disease, when severe, causes a yellowish-brown burnt appearance of the margins of the leaves with also some leaf shedding. It is likely to be more severe in districts where conditions of high humidity occur, often for several days at a time.

It has been recorded and is common on white clover but these are its first records on lucerne. The development of this disease on lucerne has been reviewed by Sundheim and Wilcoxson (1965).

BACTERIAL DISEASE

BACTERIAL WILT (*Corynebacterium insidiosum* (McCulloch, 1925), Jensen, 1934)

Yellow, stunted plants were first seen in lucerne stands in mid-Canterbury in April, 1970.

Infected plants were scattered throughout stands, although sometimes there were obvious patches of the disease. In general, they were easily

detected among the healthy plants because of their yellow-green colour and stunted growth. However, plants showing a range of symptoms (from mild to severe) were present within most stands. Mild symptoms consisted of leaf mottling together with slight cupping or curling upwards of the leaflet margins and some reduction in plant height. Moderately affected plants showed mottling and cupping of leaflets, height reduction, and often a proliferation of stems giving a "witches'-broom" effect. Severely affected plants were only a few inches high, with thin, spindly stems and small leaflets often distorted and showing bleaching either marginal or entire. Dead plants were seen within infected stands. The symptoms observed seemed to represent stages in the natural progression of the disease. Only in times of moisture stress were infected plants seen to be more severely wilted than healthy plants.

When the main taproot of infected plants was cut obliquely, a ring of yellow-brown discoloration could be seen at the junction of the cortex and vascular cylinder. The cortical layer, when peeled away, revealed a yellow-brown discoloration of the inner surface which contrasted markedly with the white colour in healthy plants. In many cases, plants with no above-ground symptoms showed either a yellow-brown streaking of the vascular cylinder or complete vascular discoloration.

Infected plants set less seed than healthy ones.

The disease was identified (Close and Mulcock, 1972) as being caused by *Corynebacterium insidiosum*.

A survey has shown that it is widespread in mid-Canterbury, and in north Canterbury it is present at Springbank, Lincoln and Greenpark. There are records of its occurrence in one crop in north Otago and another in south Otago. A further survey is in progress to determine the distribution of this disease.

The present lucerne varieties Wairau and Chanticleer are susceptible. The disease is more severe in irrigated than in dry land stands, and perhaps more severe in crops on heavier than on lighter soils.

The following varieties—resistant to bacterial wilt in U.S.A.—have been imported: Atra 55, Caliverde 65, Cody, Dawson, Iroquois, Kanza, Lahontan, Mesilla, Ranger, Saranac, Thor, Vernal, Washoe, 520 and 530. They have been included in six variety trials in Canterbury—on clean or infected land, either irrigated or dry—to determine which cultivar is agronomically most suitable.

The host range of bacterial wilt includes *Medicago sativa*, *Medicago falcata*, other *Medicago* spp., and *Melilotus alba*.

OTHER DISEASES

Full information on the following diseases is in a previous review (Close, 1967):

COMMON LEAF SPOT (*Pseudopeziza medicaginis* (Lib.) Sacc.)—prevalent in crops; causes small (up to 3 to 4 mm diameter), circular brown to black spots; when severe, yellowing and shedding of leaflets does occur.

YELLOW LEAF BLOTCH (*Pseudopeziza jonesii* Nannf.)—not common; causes yellow stripes and blotches.

STEMPHYLIUM LEAF SPOT (*Pleospora herbarum* (Fr.) Rab. (*Stemphylium botryosum* Wallr.))—common in crops; spots are 3 to 5 mm diameter, circular, light-brown in centre with dark margin; has a wide host range.

ANTHRACNOSE (*Colletotrichum trifolii* Bain and Essary)—not common; causes dark brown lesions on stems and petioles.

LEAF SPOT AND ROOT ROT (*Leptosphaeria pratensis* Sacc. and Briard)—causes circular to angular pale brown leaf spots (2-10 mm) with pycnidia in lesion, and of more importance the brown to black root and crown rot.

SCLEROTINIA CROWN AND STEM ROT (*Sclerotinia trifoliorum* Eike)—primarily a soft rot of crown and basal parts of stems—where small black sclerotia may develop.

RHIZOCTONIA ROOT ROT (*Pellicularia filamentosa* (Pat.) Rogers)—causes a crown rot, and dark brown root cankers.

FUSARIUM ROOT ROT (*Fusarium* spp.)—attacks damaged crowns in autumn and winter, and causes wilting and dying of plants in the spring.

LUCERNE MOSAIC VIRUS—causes mottling of leaves and stunting of plants, symptoms more severe in spring, shoots produced in summer may appear healthy.

DISCUSSION

Research is in progress on the significance of seedling disorders, foliage pathogens and bacterial wilt. This may lead to the use of seed treated with fungicides, perhaps of systemic fungicide sprays, and to the adoption of new varieties. A variety for Canterbury must be resistant to bacterial wilt. It also is desirable that it be resistant to stem eelworm (*Ditylenchus dipsaci* (Kuhn)) and to the foliage pathogens. There may be varieties from the United States that fulfil these criteria and prove to be suitable agronomically. The alternatives are the breeding, in New Zealand, of a new variety and/or the selection of resistant clones within the variety Wairau.

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