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Learning to live with clover scorch

by A. BOKOR, Plant Pathologist, and D. L. CHATEL, Research Officer, Plant Research Division

Recent research has increased our understanding of clover scorch disease in Western Australia. An economic control has yet to be developed but it appears that management can be adjusted to reduce damage to pastures and there is scope for using resistant species and less susceptible cultivars to escape the disease. A major research programme is in progress.

Clover scorch was first recorded in Western Australia as a disease which mainly affected Yarloop subterranean clover in the higher rainfall areas. Early observations suggested a wilt condition and the name Yarloop wilt was adopted.

Subsequently, in 1971, the causal fungus Kabatiella caulivora was isolated from "Yarloop wilt"-affected clover. This organism causes the disease known elsewhere as northern anthracnose, or clover scorch, known since 1902 in the cool temperate regions of the Northern Hemisphere as a disease commonly affecting red clover (T. pratense) pastures.

In Australia, this disease was first recognised on subterranean clover in New South Wales and South Australia in 1955. In Western Australia it was first reported to the Department of Agriculture in the dairy areas around Bridgetown, Denmark and Capel in the early 1960's; it may have been present but unrecognised much earlier.

After 1962 there were spasmodic reports from the Albany, Bunbury and Esperance areas, until 1970, when many cases of serious infection were reported from the Albany and Bunbury areas. But it was not until the severe epidemic of 1971 that the disease became widely recognised. This outbreak spread rapidly throughout the south west...
and south coastal areas from Bunbury to Esperance (see map).

Fortunately there was much less disease in the following season, the affected areas being centred around Walpole and Alexander Bridge.

**Symptoms**

The earliest sign of the disease is turning of the leaves exposing the undersurface in a characteristic manner. Initially only an occasional leaf turns but more and more do so as time goes on. Darkened lesions may appear on the petioles (leaf stalks) at or near the junction of the leaf. This is followed by the collapse and death of affected parts. Typical symptoms are shown in the colour plates. The lesions are usually sunken or grooved and may be found anywhere on the petiole and on stems and runners as well as the peduncles (burr stalks).

As the disease progresses the clover stand "opens up" and in severe cases gives affected paddocks a burnt or scorched appearance. The dramatic collapse of some stands may closely follow a sudden warm period in late spring, which appears to put diseased plants under stress.

**Effect on production**

1. **Hay production:** Total collapse of clover in paddocks closed up for hay often occurs. Many dairy farmers have estimated the hay production over the farm to be reduced by as much as 50 per cent in seasons which favour disease.

2. **Winter and spring pasture production:** Disease development in late winter and spring pasture growth has reduced the grazing capacity on a number of farms by as much as 30 per cent. In severe cases stock may have to be agisted or feed bought in. There may be no real effect on carrying capacity on understocked farms despite considerable loss of clover.

3. **Fertiliser wastage:** Severe disease levels result in wastage of fertiliser applied in spring.

4. **Pasture deterioration:** Pastures with a reduced clover component become weed dominant and can become almost useless.

Resowning of badly run-down pastures can be very costly.

5. **Seed production:** It has been estimated that a substantial proportion of the reduction in seed production in the Esperance area in the 1971-72 seed harvest was a direct result of the serious *Kabatiella* outbreak in 1971. Regeneration of clover in paddocks that have set little or no seed is impaired.

**Host range**

The occurrence of *Kabatiella* has led to many questions concerning the near dependence of many Western Australian farmers on subterranean clover and has resulted in renewed interest in alternative species.

Observations have been made in recent years on the degree of susceptibility of many pasture species to clover scorch. For practical purposes white clover (*T. repens*), strawberry clover (*T. fragiferum*), drooping flowered clover (*T. cerinum*), serradellas (*Ornithopus spp*) and medicos (*Medicago spp*) may be regarded as resistant. However, it may not be necessary to obtain a completely immune alternative, because a partially resistant subterranean clover might prove more productive than a completely resistant alternative.

Of the subterranean clovers, Yarloop and Woogenellup are the varieties most commonly reported as having the disease—they are also the most widely grown ones in disease-prone areas. Yarloop rarely recovers after a severe attack whereas Woogenellup appears to have the capacity to recover—even when it has lost all its leaves.

Observations made on farm and experimental sowings at the end of 1971 showed that there were large differences between subterranean clover varieties in their reaction to clover scorch.

Some of the least affected clovers included Mt. Barker, Daliak and Toodyay C. The first of these is suited for the development and success area which were devastated during 1971. Toodyay C is a local selection and it is hoped that its initial promise will be substantiated in further tests, since it appears to be agronomically suited as a replacement for Woogenellup in many areas.

**Disease development**

The disease is most commonly seen in dense ungrazed clover-dominant swards; however it can also develop in more open pastures and prevail in spite of grazing. Carry-over of the disease from one season to another is by means of spores produced the previous year, however the conditions ideal for spore survival are not yet known. Spires survive over summer in and on clover residues and on semi-decomposed debris in the soil surface. New seedlings emerge through this material and become infected by the spores. The earliest the disease has been observed in Western Australia is in the second half of May, four to six weeks after the opening rains.

If favourable weather follows an early break, the disease may build up in the mild weather before the colder temperatures of winter arrest further development. With the return of milder temperatures of spring there may be a resurgence of disease activity and the fate of spring pastures will be influenced by the degree to which the disease developed earlier in the season. For the disease to be most destructive, a prime requirement seems to be an early break followed by a wet and prolonged spring, characterised by a large number of rainy days. When these conditions prevail, such as in 1971, hay cutting is delayed, increasing the chances of complete pasture collapse. More observations are needed before it will be possible to predict disease incidence and severity.

Moderate temperatures of about 20°C, and wet conditions are most suited for the development and spread of the disease. The spores are produced in slimy masses on the disease lesions and they could be transferred to other leaves and plants by rain-drop splash, contact between unaffected and affected
Disease control

In spite of much research into the problem, both in Australia and overseas, no really satisfactory control measures are available. At present, it is necessary to learn how to live with the problem and adjust management practices accordingly.

Heavy grazing is one means of keeping the disease in check, providing the disease has not led to the complete collapse and rotting of the pasture. Grazing removes much of the infected material which causes continual reinfection of the new unaffected growth. It also reduces the spore load on the affected plants.

The removal of the spore laden clover residues by grazing over the summer period is also a good practice as it minimises the chances of the reappearance of the disease. This might also be achieved by burning and/or autumn cultivation. Unfortunately burning is not a realistic proposition in severe cases since collapsed stands usually rot away and there is little to burn.

Introduction of a crop into the system in areas where cropping is economical reduces the infection in the following year. Improvement has also been noted after an early sown fodder oat crop.

Paddocks either ungrazed or closed for hay production should be watched closely. If the clover is starting to collapse it should be grazed or cut for silage.

Chemical control with fungicides is feasible but generally not economically or widely applicable on a broad-acre basis. To ensure a hay crop free from clover scorch, experiments have indicated that a minimum of 270 g active ingredient per hectare (3.6 oz. per acre) of either of the systemic fungicides benomyl or thiobendazole applied in two sprays 4-5 weeks apart is required. This represents an expenditure of $10 per hectare ($4 per acre) for the chemical alone in the case of benomyl.

Alternative legume species such as serradellas and medics can perhaps be considered in cases of failure of the subterranean clovers, but the two least susceptible subterranean clovers, Daliak and Mt. Barker, probably provide a more stable pasture despite some growth reduction due to the disease.

CURRENT RESEARCH

Several lines of research are being pursued in order to improve our understanding of the disease:

- Annual surveys are conducted to determine the severity of the disease from year to year. The disease is being examined in the field with regard to management practices and seasonal variations.
- Climatic data is being examined to determine how rainfall, temperature and length of growing season might influence the disease.
- Work is in progress to see how the spores survive the summer. Spore population and viability are being assessed on clover herbage material during the growing season.
- Observations are to be made of the effect of shallow cultivation of affected pastures on subsequent disease development.
- The mode and development of the primary infection is being studied in the glasshouse.
- Glasshouse and field trials are continuing to test the reaction of a wider range of subterranean clovers to the disease. The primary aim of this work is to select useful clover material either for field use or for inclusion in a clover breeding programme.
- Very susceptible and slightly susceptible subterranean clovers will be compared in the field in such a way as to obtain an absolute measure of the nature, timing and amount of pasture loss due to Kabatiella.
- Chemical control trials are continuing to further test a range of systemic fungicides and the timing of spray applications.