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Clubroot

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Clubroot is throughout this field trial but is severe in the middle of the plot.

Rachel Lancaster, Caroline Donald and Ian Porter, outline some control measures for clubroot, one of the most serious diseases of crucifers world wide.

What is clubroot?
Clubroot is caused by the fungus Plasmodiophora. The fungus infects crucifers (e.g. cauliflower, cabbage, broccoli and Chinese cabbage) causing large knotted galls to form on the roots. The galls prevent the uptake of water and nutrients by the plant causing wilting in warm weather, which is the first noticeable symptom of clubroot infected plants. Severely infected plants are usually stunted and do not produce marketable crops.

Clubroot in Western Australia
The clubroot fungus has been detected in crucifer crops throughout the south-west of Western Australia. The disease is of particular concern to the crucifer industry which was valued at approximately $30 million during 1995/96. Exported product accounts for much of the value of the industry.

The disease was first detected in the Manjimup district about six years ago with the area infected on each farm varying from a few square metres to several hectares. New areas that are infected with the disease are detected each summer.

It may take several years for clubroot symptoms to become evident as a critical spore load in the soil is required before symptoms are obvious. This means that an infection may have occurred several years before the symptoms are noticed, making control of the disease difficult.

Clubroot management
The first step to managing clubroot is to minimise the possibility of infection by maintaining good on farm hygiene.

Attention to hygiene is vital and care must be taken not to transport infected soil within or between farms. Machinery, vehicles, other farm equipment and people's shoes should be washed and all soil removed.

The success of organic, fertiliser and chemical treatments for the management of clubroot has been examined in experiments both in Western Australia and Victoria.
Treatment application for clubroot trial. Some treatments are applied two weeks before planting to prevent burning the plants.

Several treatments have shown promise and further evaluation of these treatments and new products is continuing.

Liming to increase soil pH and rotation of crucifers with non-cruifer crops are useful management techniques for clubroot control. These techniques work better when used together rather than in isolation.

The clubroot fungus has greater virulence as the pH of the soil becomes more acidic. Liming areas in which crucifers are to be grown has provided some success for managing the disease. This is especially the case in Manjimup where many of the soils are acidic with a pH of less than 5.5.

Types of lime that can be used are quicklime (calcium oxide), g-lime (calcium hydroxide) and agricultural lime (ground limestone, lime sand or calcium carbonate). The type of lime which should be used depends on the cropping program on each farm.

Rotation of crucifer crops with non-cruifer crops such as potatoes and corn or with pasture has also been a useful technique for managing the disease. A rotation of at least three years between crucifer crops will reduce the spore load in the soil.

Liming and rotation will not kill the fungus but they will allow a crop to be grown to produce a satisfactory yield on what otherwise would become non-productive land in respect to crucifer production.

Fluazinam (Shirlan®), a fungicide registered for clubroot control has provided good control in the Perth metropolitan area although mixed success has been achieved in Manjimup.

The reduced effectiveness of fluazinam at Manjimup is believed to be due to the poor infiltration of the product into the local soil types. To be effective against clubroot, the fungicide must infiltrate the soil around the roots of the plant.

Some soils in the Manjimup area do not readily allow the infiltration of the fungicide into the root zone. In trials we have shown that where fluazinam had been applied the roots were free from clubroot for the first few centimetres. But clubroot infection occurred below this depth because the fungicide did not infiltrate any deeper. Different techniques for the application of the fungicide are being examined to overcome this problem.

Calcium cyanamide (Perlika®) is a fertiliser which has increased the
yield of crucifers in Victorian trials although this has not been as successful in WA due to the product causing phytotoxicity. In the presence of moisture, calcium cyanamide is converted to lime and the toxic product hydrogen cyanamide.

The hydrogen cyanamide breaks down to its non-toxic end products. At least two weeks should be allowed between the application of the fertilizer at the recommended rate and the planting of the crop.

Preliminary results from experiments at Manjimup indicate that the product has caused little phytotoxicity in these experiments and a full assessment of the product will be possible.

**A national approach to clubroot research and extension**

A project examining options for clubroot control was conducted by Agriculture Victoria and Agriculture Western Australia between 1994 and 1997.

Trial sites were located at Werribee, Lindenow and the Mornington Peninsula in Victoria and at various locations within the Manjimup district in WA. The aim of the project was to develop economically viable options for growers that would allow the continued production of crucifers on clubroot infected land.

The current clubroot research project consolidates the investigation into the best possible management practices for the disease. The project also assesses the impact of these measures on the post-harvest life of the crop.

The project has expanded to also include research and extension in New South Wales, South Australia, Tasmania and Queensland.

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