Biological control of doublegee: fungi may be another weapon

Roger Shivas

John Scott

Follow this and additional works at: https://researchlibrary.agric.wa.gov.au/journal_agriculture4

Part of the Plant Pathology Commons, and the Weed Science Commons

Recommended Citation
Available at: https://researchlibrary.agric.wa.gov.au/journal_agriculture4/vol35/iss2/6

This article is brought to you for free and open access by Research Library. It has been accepted for inclusion in Journal of the Department of Agriculture, Western Australia, Series 4 by an authorized administrator of Research Library. For more information, please contact library@dpird.wa.gov.au.
Fungi may be another weapon

By Roger Shivas, Plant Pathologist, Plant Protection Branch, South Perth, and John Scott, Research Scientist, CSIRO, Floreat

The fungus was found to have a host range limited to doublegee and a few closely related docks. In late 1990, permission was granted by the Australian Quarantine and Inspection Service to introduce an isolate from South Africa into the quarantine facility at the CSIRO Division of Entomology in Canberra. By this time the fungus had been given a name, *Phomopsis emicis*. It differed from most pathogens introduced into Australia for biological weed control in that it was not obligate. This means that the fungus could live on dead plant material and did not require a living host to survive.

Further studies in controlled environment glasshouses determined the optimal conditions for infection. The fungus caused severe stem blight which ultimately kills the plant. It also infects seeds, and caused up to 30 per cent mortality at a field site near Badgingarra.

In 1984, a plant pathologist who was studying diseases of doublegee in South Africa found a fungus which caused a stem blight and leaf spot. The pathogen was an unnamed species of *Phomopsis*, a close relative of the fungus responsible for lupinosis in Western Australia. He suggested that the fungus might play a role in reducing natural populations of doublegee.

A combined Western Australian Department of Agriculture and CSIRO research project was initiated in 1989 to investigate. The first year was spent screening isolates of the fungus in South Africa in order to find one that was highly virulent. At the same time, tests were done to determine the range of plants that it would infect. The fungus would only be allowed into Australia if it did not pose a threat to agriculture and environment.

In 1984, a plant pathologist who was studying diseases of doublegee in South Africa found a fungus which caused a stem blight and leaf spot. The pathogen was an unnamed species of *Phomopsis*, a close relative of the fungus responsible for lupinosis in Western Australia. He suggested that the fungus might play a role in reducing natural populations of doublegee.
Fungal pathogens have been used successfully in the past as weed control agents. The best known example in Australia is control of one of the forms of skeleton weed by a rust fungus in the Eastern States.

Two other fungal pathogens in South Africa have potential to contribute to doublegee control. These are a leaf spot fungus (Cercospora tripolitana) not previously reported in Australia and the dock rust (Uromyces rumicis). Although the rust has been recorded on fiddle dock near Albany, it has never been reported on doublegees in the field in Australia. There is a good chance that virulent strains of these pathogens occur in South Africa which could be introduced into Australia.

In 1991, a survey showed that the fungus was already present in most Australian States. Although widespread, it had not been noticed previously because it was rare and never produced obvious disease in the field. This provided the opportunity to collect more isolates for study without the need for quarantine.

The intention at this time was to determine whether the fungus could be developed as a mycoherbicide. It was envisaged that by spraying doublegees with massive amounts of fungal spores an epidemic of stem blight could be induced.

An unexpected discovery in 1992 ended this possibility. Phomopsis emicis was found to produce large amounts of a mammalian mycotoxin called phomopsin, the same one responsible for lupinosis in sheep. The doublegee stem blight fungus is only the second of 900 species of Phomopsis known to produce phomopsin. The project ceased at this point.

Meanwhile, in 1992 field trials were carried out at Watheroo, Badgingarra and Wongan Hills, to determine the possible causes of a natural doublegee decline first noticed in 1990. At Badgingarra and Watheroo up to 30 per cent of doublegee seeds were found to be infected with Phomopsis emicis. Infected seeds do not germinate. However doublegees produce a persistent and substantial seed bank and even a 30 per cent mortality is unlikely to reduce plant populations in the following season.

Further reading

Roger Shivas can be contacted on (09) 368 3377

Rust on doublegee caused by Uromyces rumicis.