

**THIS THESIS HAS BEEN ACCEPTED FOR THE AWARD OF THE DEGREE
OF
MASTER OF AGRICULTURAL SCIENCE**

**Investigation of *Fusarium oxysporum* f. sp. *cepae* and
Phoma terrestris on onion (*Allium cepa*) in the Mid
Murray region of South Australia**

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Abstract

Two fungi that cause disease on onion in the Mid Murray region of South Australia were investigated. These were *Fusarium oxysporum* f. sp. *cepae*, the cause of damping off of seedlings, wilting in the field, and basal rot in storage, and *Phoma terrestris*, which causes pink root. The aim of the study was to investigate resistant or tolerant cultivars and crop rotations as possible management strategies for these diseases.

Several *Fusarium* spp. were isolated from onion roots and bulbs in the field, onion bulbs in storage, soil, and onion seed. All isolates were tested for pathogenicity by various means, however, none caused disease and therefore could not be identified conclusively as *F. oxysporum* f. sp. *cepae*. As a result research on *Fusarium* was discontinued.

Pink discolouration was detected on onion roots in commercial crops at Bowhill, South Australia, and isolation of *P. terrestris* from roots was attempted. Several published and novel methods were employed with variable success. Only one of the published methods yielded *P. terrestris*, but results were inconsistent. Two methods developed in this study permitted isolation of *P. terrestris*. In both cases, infested plant material was incubated on wheat straw agar (WSA), which turns pink in the presence of *P. terrestris*. One method involved soaking surface sterilised pink-pigmented wheat straw in solution, at approximately 24°C for 2 days, and then spreading 1 ml of the resulting suspension on acidified potato dextrose agar (APDA) and incubating for a further 7 to 10 days. The second method involved dispensing warm sterile water into a plate of pink-pigmented WSA, agitating the plate, and spreading 1 ml aliquots onto APDA, and incubating for 7 to 10 days. One isolate of *P. terrestris*, shown to be pathogenic to onion was used in subsequent experiments.

Several brown onion cultivars commonly grown in the Mid Murray region of South Australia, or marketed as tolerant to pink root, were examined for susceptibility to infection by *P. terrestris*. Seven cultivars were tested *in vitro*, and seedlings of eight cultivars were grown in a greenhouse for 4 months in soil naturally infested with *P. terrestris*. Selected cultivars were also evaluated in the field. Of the cultivars tested, none was significantly less susceptible to infection by *P. terrestris* than any other as indicated by pink pigment on WSA.

Cereals such as wheat, oat and barley, as well as lucerne and canola, are grown in rotation with onion to provide ground cover, to minimise soil erosion and reduce inoculum of pathogens between onion crops. As the susceptibility of these rotation crops to *P. terrestris* was not known, several were tested in the field and in the greenhouse for their ability to act as hosts for *P. terrestris*. Likewise, the potential of weeds commonly found in onion fields to act as hosts of *P. terrestris* was investigated. Less *P. terrestris* was detected in the roots of plants of oat cultivars Marloo and Swan, as well as barley cultivars Galleon and Schooner than of most other crops tested and, thus, these cvs were considered less likely to act as hosts of *P. terrestris*. Weeds such as *Brassica tournefortii*, *Portulaca oleracea* and *Oxalis pes-caprae* collected from the field were infected by *P. terrestris*, whereas *P. terrestris* was not detected in the roots of *Chenopodium album*.

In summary, new methods for isolation of *P. terrestris* were identified and may, with further development, aid in research on pink root. The onion cultivars tested in this study did not differ in susceptibility to pink root, but more cultivars should be tested. *P. terrestris* infected a range of other crops and weeds, and it is recommended that further work is conducted in this area to facilitate cultural management of onion crops to minimise build up of inoculum in the soil.

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying, subject to the provisions of the Copyright Act 1968.

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