



*Know-how for Horticulture*

**Identification and  
management of parsley  
root rot**

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VIC Department of  
Primary Industries

Project Number: VG06046

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### **Purpose of project:**

This report details the outcomes of a 12-month project continuing the research from a previous scoping study investigating root rot in parsley (VG04025). This project carried out trials to identify parsley cultivars tolerant to root rot in both Queensland and Victoria and evaluated fungicide alternatives and a biocontrol agent for disease control.

**Report completed: August 2007**

### **Funding acknowledgments**

The researchers acknowledge the financial support for this project from Horticulture Australia Limited (HAL), AUSVEG, the Federal Government and the Department of Primary Industries, Primary Industries Research Victoria.

### **Acknowledgments**

The authors thank the members of the advisory group, Craig Arnott, Peter Cochrane, Tony & Rocky Lamattina, Karl Riedel, Lisa & Ray Crookes and Rodney Dunn. The assistance of Peter Cochrane and Craig & Gavin Arnott in Victoria as well as Rodney Dunn and Ray & Lisa Crookes in Queensland in providing field sites and planting and maintaining field trials is gratefully acknowledged. The biofungicide preparation Polyversum™ was kindly donated by the company Biopreparaty (Prague, Czech Republic) for our use in trials in Australia. Sincere thanks are also extended to the seed and chemical companies who willingly provided in-kind support for this project. Dr James Cunningham identified oomycetes and Mr. Eric Trebilco & Ms. Alex Glauredt provided valuable technical assistance with field trial and pathogenicity tests.

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## Media Summary

### Unravelling parsley root rot

Scientists continue to unravel the problem of root rot in parsley and investigate control options. The disease can cause up to 100% crop losses in Victoria and Queensland. In Victoria, parsley root rot during summer was associated with the fungus *Fusarium*, but in winter, it was caused by the water moulds *Pythium* and *Phytophthora*.

Symptoms of summer parsley root rot, associated with *Fusarium*, were dry, cracked, red-brown lesions on the roots with no above ground symptoms and minimal crop losses. Chemical controls may not be required under such conditions. However, this may not be the case if *Fusarium* has a major impact on crop yields.

Winter parsley root rot, associated with the water moulds *Pythium* and *Phytophthora*, attacks both seedlings and mature plants, causing a spongy dull brown rot resulting in a complete and often rapid collapse of the root system and major crop losses.

The screening of flat-leaf cultivars in Victoria identified that the cultivar Shamrock had up to 70% less root rot than other cultivars. It could be a useful cultivar to grow in areas where both summer and winter root rot is an issue.

A fungal biocontrol preparation of the naturally-occurring mycoparasite water mould, *Pythium oligandrum*, was effective against water moulds in pot trials, but the commercial preparation of the same fungus, Polyversum™, was ineffective in the field under both low and high disease pressure. The mycoparasite may be of use in the hydroponics industry.

Information resulting from this research can be accessed from the HAL final report VG06046 'Identification and management of parsley root rot' and nationally through the Vegetable Industry Development Officer network.

This research was led by scientists at the Department of Primary Industries Victoria Knoxfield Centre, in collaboration with Queensland Department of Primary Industries and Fisheries. The project was facilitated by Horticulture Australia Limited (HAL) in partnership with Federation of Potato and Vegetable Growers Australia Limited (AUSVEG) and was funded by the National Vegetable Levy. The Australian Government provides matching funding for all of Horticultural Australia's Research and Development activities. The researchers gratefully acknowledge the financial support of the Department of Primary Industries through Primary Industries Research Victoria.

## Technical Summary

Growers reported that root rot of parsley caused up to 100% crop losses in Queensland and Victoria for a number of years. In Victoria the problem is worse in late autumn through winter when conditions are cool and wet and is associated with *Pythium* and *Phytophthora*. In Queensland, growers reported root rot was worse during the wet season. Some Queensland growers have established hydroponics production to avoid crop losses and maintain production through the wet season.

This project built on an earlier scoping study to further investigate management of root rot disease on parsley in both Queensland and Victoria by:

- (i) identifying cultivars less susceptible to root rot,
- (ii) seasonal management of the disease with a biocontrol agent and fungicides and
- (iii) pathogenicity trials of Queensland isolates.

Of the six flat-leaf parsley cultivars trialled in Victoria, Shamrock had up to 70% less root rot than other cultivars but root rot symptoms were associated with *Fusarium*, rather than oomycetes. Consequently, the susceptibility of parsley varieties to root rot associated with oomycetes remains undetermined. The susceptibility of 8 curly leaf and 5 flat leaf varieties to root rot in Queensland is also unresolved due to the prevailing drought.

Under summer conditions in Victoria, parsley roots are often associated with dry red-brown wrinkled root lesions, which rarely produce above ground symptoms. In a field trial designed to target oomycetes, chemical treatments had little effect on the incidence of root rot. *Fusarium*, not oomycetes, was responsible for parsley root rot under summer conditions in Victoria and was particularly severe in the summer of 2003/4. Application of chemicals for root rot against oomycetes in Victoria during summer may not be necessary.

The biocontrol agent *Pythium oligandrum* showed efficacy in pot trials as a mycoparasite to protect parsley plants from the pathogen, *P. sulcatum*. However, Polyversum™, a commercial preparation of *P. oligandrum*, did not limit root rot incidence in parsley under low disease pressure in summer associated with *Fusarium*, or high disease pressure in winter associated with oomycetes.

Pathogenicity was demonstrated for *Alternaria petroselini*, two isolates of *Fusarium*, *F. oxysporum*, *Pythium diclinum* and *P. irregulare* on both curly and flat leafed cultivars. The curly leafed cultivar appeared more susceptible than the flat leafed cultivar at higher temperatures. To-date only *A. petroselini* has been associated with an epidemic in the field.

The difficulties experienced in conducting trials during prevailing drought conditions highlights the risks associated with conducting field studies in research projects of short duration.

## Recommendations for further research

- Test Polyversum™ in both hydroponics and glasshouse systems to assess efficacy against parsley root rot.
- Test suitability of other potential biocontrol agents under controlled conditions and in the field.
- Assess cultivars, both flat-leaf and curly-leaf, for resistance against root rot and yield potential in Victoria under low and high disease pressure.
- Establish the pathogenicity of Victorian isolates of *Fusarium* associated with parsley roots during summer, establish if there is a yield loss and if necessary develop management strategies for Queensland and Victorian parsley crops.
- Chemical efficacy trials targeting *Fusarium* under summer conditions in Victoria.

## Chapter 5

### Technology transfer and recommendations

#### Summary

This chapter reports on the benefits of a project advisory group established to oversee research projects. This group increased communication and cooperation between growers, researchers and allied support businesses and resulted in an accelerated impact of research and development within the parsley industry. Recommendations for future research are presented.

#### 5.1 Introduction

The research reported herein is the result of collaboration between industry advisory groups and project steering committees. These groups consisted of vegetable growers, crop consultants and chemical resellers, with diverse experiences which they brought to the project. The groups provided an opportunity for researchers to describe their approach and current progress thus promoting the impact of research and development projects. They also enabled growers and allied industries to ensure their needs are being met by the research project. The advisory group approach worked very well and is DPI's preferred method of involvement with the Vegetable Industry.

This interaction and collaboration with growers, vegetable industry development officers (IDOs) and the subcontracting of sections of work to industry experts has been of enormous benefit to the project. Growers in The Australian Herb and Spice Industry Association were identified through contacts with parsley growers in Queensland. The IDOs identified parsley growers in other states. The advisory committee encouraged the researchers to promote the results of the research to growers nationally in industry publications.

#### 5.2 Industry advisory group

The Department of Primary Industries Victoria has taken the approach of inviting growers and private allied support business representatives to volunteer their time and join with researchers to plan and discuss parsley disease issues first hand. Not all growers are in the position of being able to volunteer their time due to the demands of growing and marketing vegetables and consequently the researchers are extremely grateful to those who were able to contribute.

The advisory group members who supported project VG06046 were:

Craig Arnott – Market Gardener – Arnotts Vegetable Farms – Clyde, Vic.

Peter Cochrane – Market Gardener – P.J. and J. Cochrane Pty Ltd – Devon Meadows, Vic.

Rocky and Tony Lamattina – Market Gardeners – A. D. Lamattina & Sons – Clyde, Vic.

Karl Riedel – Vegetable Crop Agronomist – E.E. Muir & Sons – Cranbourne, Vic.

Lisa and Ray Crooks – Riverview Herbs – Chamber Flat, QLD

Rodney Dunn – Market Gardener– Rochdale, QLD.

#### 5.3 Dissemination of information to industry

Adults acquire information in different ways such as reading, talking and visual cues. Some forms of information distribution will be more useful or accessible than others. There are many methods to distribute information to growers, such as field days, industry publications, workshop meetings and steering committees. During the course of this project we have endeavoured to utilise a broad range of information delivery methods and take every opportunity to report to industry. The Appendix lists the steering committee meetings, field days, workshops, industry publications and technical publications.

## 5.4 Recommendations

*The major recommendations to growers from this work are:*

- The flat leaf parsley variety Shamrock is less susceptible to root rot in Victoria and may be a suitable cultivar for growing under conditions of expected high disease pressure.
- Root rot in summer in Victoria is associated with *Fusarium* which appears to have a low impact on production, consequently control may not be warranted.
- Control of root rot of parsley associated with oomycetes is only necessary during winter when disease pressure is high.
- The application of metalaxyl-m has some efficacy to control damping off during summer but should be used judiciously to comply with resistance management strategies.
- The use of the biocontrol agent in-ground is not justified as it did not control root rot in these trials.

*Areas of future research which would benefit the industry are:*

- Test Polyversum™ in hydroponics systems to assess its efficacy against parsley root rot caused by water moulds (oomycetes).
- Establish the pathogenicity of Victorian isolates of *Fusarium* associated with parsley roots during summer; establish if there is a yield loss and if necessary develop management strategies for Queensland and Victorian parsley crops.
- The Queensland field trials to identify (i) cultivars less susceptible to root rot and (ii) chemical management options need to be repeated, as they were abandoned due to drought.
- Trials to identify cultivars less susceptible to winter (oomycete) root rot under consistent winter conditions are required in Victoria.

## 5.5 Publications

Anon (2006). The cause of root rot in parsley uncovered. *Vegetables Australia Review* 2006. p 32.

Auer, D., Minchinton, E., Cunnington, J., Thomson, F., Martin, H., Forsberg, L. and Tesoriero, L. (2006). Identification and control of root rot of parsley in Victoria. *Proceedings of the 4<sup>th</sup> Australasian Soilborne Diseases Symposium*, Millennium Hotel, Queenstown, New Zealand 3–6 September 2006, p 24–25.

Cunnington, J.H., Minchinton, E.J., Auer, D.P.F. and Martin, H.L. (2007). First record of *Alternaria petroselini* sensu lato causing leaf blight on parsley in Australia. *Plant Pathology* **56**: 723.

Minchinton, E. and Martin, H. (2007). Parsley rot study set to continue. *Good fruit and Vegetables, Vegetable Platter*, **17**: 19.

Minchinton, E.J. and Auer, D. (2007). Parsley root rot research set to continue. *Vege Link, Victorian Vegetable Growers*, autumn issue **29**: p 6.

### Steering committee meeting:

12<sup>th</sup> September 2006, Cranbourne, Vic.

### Field day:

29<sup>th</sup> June 2007, Moores Rd, Clyde, Vic.

### Conferences:

4<sup>th</sup> Australasian Soilborne Diseases Symposium, Millennium Hotel, Queenstown, New Zealand, 3–6 September 2006. Oral presentation of current project.

Australian Herb and Spice Industry Association Conference, Hahndorf, SA, 4–5 September 2006.

National Vegetable Expo, Werribee, Vic., 3–4 May 2007.

Ausveg Conference, Sydney, NSW, 30–31 May 2007.

Australian Herb and Spice Industry Association Workshop, Melbourne Victoria, 25–26 September 2007. Oral presentation of current project.

### Posters:

Auer, D.P.F., Minchinton, E., Cunnington, J., Martin, H. and Fiona Thomson (2007). Root rot in parsley: effect and cause.