



*Know-how for Horticulture™*

**Disease management  
of potatoes on  
Kangaroo Island**

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SA Research &  
Development Institute

Project Number: PT02036

## **PT02036**

This report is published by Horticulture Australia Ltd to pass on information concerning horticultural research and development undertaken for the potato industry.

The research contained in this report was funded by Horticulture Australia Ltd with the financial support of South Australian Potato Industry Trust, Kangaroo Island Irrigated Seed Producers and Southern Choice.

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ISBN 0 7341 0914 8

Published and distributed by:  
Horticultural Australia Ltd  
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Sydney NSW 2000  
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**Horticulture Australia Limited  
Final Report PT02036**

**Disease Management  
of Potatoes on  
Kangaroo Island**

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**May 2004**

## **HAL Project PT02036**

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This report is the result of a two year investigation into the incidence of diseases in potatoes grown on Kangaroo Island, South Australia.

We wish to thank HAL, the potato growers of Kangaroo Island, The South Australian Potato Industry Trust and Southern Choice for funding this work.

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**May 2004**

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## **MEDIA SUMMARY**

Kangaroo Island has been shown to be an ideal area for the production of high quality seed potato tubers. Crop monitoring and soil sampling over 3 years has shown that the incidence of potato diseases is extremely low compared to many other seed potato growing areas in Australia. Quarantine restrictions on the entry of potatoes on to Kangaroo Island and careful crop management should ensure that the Island stays a unique area for the production of high quality potato seed tubers.

## TECHNICAL SUMMARY

Since 2002, extensive sampling of soil, potato plants and tubers grown on Kangaroo Island has shown that the island has a low incidence of soil borne diseases compared to other seed potato growing areas of Australia.

Fungal pathogens such as black dot (*Colletotrichum coccodes*), silver scurf (*Helminthosporium solani*), common scab (*Streptomyces scabies*) and *Fusarium* rot were rarely found. Where they did occur they were only found on a few tubers and at levels less than 1%. Diseases such as powdery scab (*Spongospora tuberosum*) and *Verticillium* wilt, which can be problems in other potato seed producing areas, were not detected on the island.

However, the main pathogen found was *Rhizoctonia solani* which was present on most properties. This fungus stunted and killed plants when they were girdled at ground level, and also caused black scurf on tubers. The disease was most common in soils with high levels of organic matter particularly when potatoes were planted after pasture.

PLRV developed in some crops at the early stages of the survey, but in recent years leaf sampling has not detected the problem, probably as a result of growers applying insecticide treatments and regular monitoring for aphids.

## **INTRODUCTION**

Kangaroo Island is an emerging and developing region for the production of premium high status potato tuber seed. As an island it is uniquely situated to produce quality seed potatoes of high health standards. However, many of the Kangaroo Island growers were new to the industry and had diversified from livestock and grazing as commodity prices resulted in low returns for the past 10 years. As a result the skill base for developing disease management strategies have been low.

The aim of this project was to sample all potato fields to determine what potato diseases occurred on Kangaroo Island, what were the main diseases and were they equally distributed on the island. In addition the regular sampling of the production areas provided an opportunity to visit growers and educate them on the importance of producing healthy crops, to help them recognise potential problems and to undertake management practices to control disease.



# TECHNICAL REPORT

## SURVEY

### Materials and Methods

Samples of potato debris, soil, potato plants (including volunteers) weeds and potato tubers were collected from different properties on several occasions since 2000.

Potato debris was collected from the ground after harvest. Numerous samples were examined at random in the field, but only 6 to 10 samples with lesions were collected and examined microscopically after incubation in the laboratory.

Soil samples were collected from a depth of 10 – 15 cms. At least 3 samples were collected across the paddock and combined to give a 1 to 1.5 kg representative sample. Soil samples were air dried and plated on to selective media to test for the presence of the black dot fungus *Colletotrichum*.

Potato plantings were examined by walking through the crop and looking for diseased plants. Weak or unhealthy plants were carefully dug up and examined and a representative sample of 3 to 20 plants taken from each planting. Plants were placed in plastic bags and returned to the laboratory in Adelaide where they were examined within 24 to 48 hours after collection. All plants were carefully washed under running water and pieces of plant tissue removed from the margins of stem or root lesions were surface sterilised. This was done by soaking plant sections for 3 minutes in 1% sodium hypochlorite, washing pieces three times in demineralised water, blotting dry and plating out on water agar or specific selective agar. Plates were incubated for 7 to 28 days before they were examined microscopically.

Tubers were either dug up in the field or collected from bins if harvest had occurred beforehand. A representative sample of at least 40 tubers were collected from each field or at random from several half tonne bins of tubers. Each tuber was carefully washed under running tap water to remove adhering soil and then incubated in sealed moistened bags for at least 7 days at 25°C. Tubers were individually examined for the

presence of silver scurf, black dot or Rhizoctonia which was then confirmed microscopically.

At some properties, additional samples of volunteer potato plants that had grown from previous crops as well as weeds such as Nightshade (*Solanum*) and Capeweed were collected and the roots examined for presence of potato pathogens.

Where tubers were dumped after harvest, the cull piles were examined and tubers with lesions or abnormal blemishes collected and examined.

At some sites, soil was swabbed from the sides of harvest bins and then plated out to determine if potato pathogens were present.

In addition to the plant and tuber samples, around 100 potato leaf samples were also collected at various times from some growing crops and tested for potato leaf roll virus (PLRV), potato virus X (PVX), potato virus Y (PVY), potato virus S (PVS) and tomato spotted wilt virus (TSWV) using standard ELISA test kits.

## Results

Sampling times and the type of samples taken are shown in Table 1. Overall, the potato crops on the island were sampled for diseases on 15 occasions and nearly 1000 tubers were examined. Some of these samples were collected by the grower, but on 5 occasions extensive inspection and sampling of crops was undertaken by the authors. The first samples of tubers were received in June 2000 when concern was expressed about the possible incidence of Black dot on seed tubers grown on the island. No disease was found on the initial samples. Extensive sampling of all known potato fields on Kangaroo Island was first undertaken in February 2002 when soil, dried potato stem debris, potato plants and tubers were collected and carefully examined. Apart from *Rhizoctonia* on a few plants no other disease was detected. Black dot and silver scurf were detected only once and this was on a small number of tubers (<1%) sampled in March 2002 (Table 2). In the March sample approximately 5% of tubers were infected with *Rhizoctonia*.

On a number of occasions cull piles left after harvest were carefully examined for the presence of diseased potatoes. In these samples, common scab was found on less than 1% of several hundred tubers examined whereas *Rhizoctonia sclerotica* were found on up to 20% of some samples.

At the other major sampling times, girdling of stems and stunted plants caused by *Rhizoctonia* was the main disease problem however it was found on less than 3% of plants in the worst affected areas. On tubers, *Rhizoctonia* infections varied from <1% to a maximum of 26% infected in some batches. In the April 2003 samples silver scurf was detected on less than 1% of the tubers tested.

A sample of approximately 200 mini tubers were examined in March 2002 and no skin blemishes or diseases were detected.

A low level (<10%) of PLRV was detected on plants in October 2001, but not in subsequent tests. TSMV, PVX, PVY and PVS were not detected at any of the 7 times samples were tested for virus.

**Table 1.**  
**Sample type and sampling time for potato diseases**  
**on Kangaroo Island 2000 - 2004**

Date	Potato debris	Soil	Sample Plants or leaves	Tubers	Weeds or Volunteer Potatoes
16 June 2000	-	-	-	+	+
14 July 2001	-	-	-	+	-
12 Oct 2001	-	-	+†	+	-
2 Feb 2002	-	-	+	+	-
14 Feb 2002*	+	+	+†	+	+
1 March 2002	-	-	-	+◇	-
5 April 2002	-	-	+†	-	-
6 June 2002	-	-	+	+	-
3 Sept 2002	-	-	-	+	-
16 Dec 2002	-	-	-	+	-
3 Jan 2003*	+	+	+†	+	-
19 Jan 2003*	-	-	+†	+	-
19 March 2003	-	-	+†	+	-
9 April 2003*	+	-	+†	+	-
18 Feb 2004*	+	+	+	+	-

\* Extensive crop inspection and sampling on Kangaroo Island

† Tested for virus

◇ Mini tubers tested

**Table 2.**  
**Potato Cultivars sampled and pathogens detected**  
**on Kangaroo Island - 2000 to 2004**

CULTIVAR	PATHOGEN
Atlantic	-
Coliban*	<i>Rhizoctonia solani</i> , PLRV*, <i>Streptomyces scabies</i>
Crystal*	-
Desiree	<i>Rhizoctonia solani</i>
Granola	<i>Rhizoctonia solani</i> , <i>Helminthosporium solani</i>
Granada	-
Kennebec*	-
Kuroda	-
Mondial	<i>Rhizoctonia solani</i>
Pontiac*	-
Ranger Russet	<i>Colletotrichum coccodes</i>
Red Rascal	<i>Rhizoctonia solani</i>
Riverina Russet	-
Ruby Lou*	<i>Rhizoctonia solani</i>
Russet Burbank	<i>Colletotrichum coccodes</i> , <i>Rhizoctonia solani</i>
Sebago*	<i>Rhizoctonia solani</i>
Shine*	<i>Helminthosporium solani</i>
Unknown	<i>Fusarium</i>

\* = tested for virus

PLRV = potato leaf roll virus

- = no disease detected

## DISCUSSION

These results show that Kangaroo Island is relatively free of soil borne potato diseases compared to some other seed producing areas in Australia and is ideally suited to the production of high quality potato tuber seed.

The incidence of soil borne diseases such as black dot and silver scurf were extremely low and were only found on a few tubers on one occasion. Diseases caused by *Rhizoctonia solani* were widespread and found on most of the properties sampled. The fungus is common to potato growing areas throughout the world and is therefore not unusual to detect it on Kangaroo Island. *R. solani* fungi are commonly associated with organic matter. On Kangaroo Island, potato crops are frequently planted in areas previously sown to pastures. The high organic matter present in soil at the time of planting potatoes is probably contributing to the high incidence of black scurf (*Rhizoctonia*) on Kangaroo Island.

Other soil borne diseases detected on Kangaroo Island were *Fusarium* dry rot and common scab caused by *Streptomyces scabies*. The incidence of these diseases was extremely low and almost insignificant considering the large number of tubers examined. The low incidence of soil borne diseases on Kangaroo Island was also confirmed by the failure to detect black dot and other pathogens in the debris, soil and plant samples collected on numerous occasions.

The diseases powdery scab caused by *Spongospora tuberosum* and *Verticillium* wilt are major problems in many potato seed growing areas of Australia. Neither of these pathogens were detected on tubers or roots of plants grown on Kangaroo Island.

Leaf samples tested on 7 occasions showed that virus as such as potato leaf roll virus (PLRV), tomato spotted wilt (TSWV), potato virus Y and potato virus X were not

common on the island. The only virus detected was PLRV in October 2001. Further infection of PLRV occurred late in the season as a result of aphid invasion close to harvest. Following this growers now carefully monitor crops for presence of aphids and apply pesticides at planting and during the growing season.

Overall this has been a successful project as growers are now well aware of the importance of pest and disease management in the production of potato seed crops.

The potato seed industry on Kangaroo Island has been a success as production has moved from growers planting a few rows of mini tubers 4 to 5 years ago to an estimated tonnage of 3,000 tons in 2005/06. The health status of KI produced seed potatoes has been a major factor contributing to the rapid expansion of the industry.

Growers have been provided with guidelines on how to manage diseases and minimise their impact. Crops are regularly monitored and tested for the presence of disease and quarantine restriction and now in place on the importation of potatoes on to the island. All these procedures should ensure that the low disease incidence is maintained and that Kangaroo Island continues to be an area producing high quality potato tuber seed.

The two potential problems are PLRV and Rhizoctonia. Regular and careful monitoring for aphids, the use of insecticides and testing for presence of PLRV| should be sufficient to manage the risk associated with this disease. Controlling Rhizoctonia will be a challenge and further research is needed.

## TECHNOLOGY TRANSFER

The results of this project have been conveyed to growers by direct contact during the frequent property visits.

In addition, a formal presentation (seminar) was given at the start of the project when the main soil borne diseases and their management was discussed with growers. On other occasions, the authors held several informal discussion groups with key growers on the property of Mr. P. MacGill. Growers have been advised to undertake the following precautions to ensure disease are not introduced or increase on their production areas:-

1. Soil test – for Black Dot and Rhizoctonia before planting.
2. Cleaning crop – Brassica biofumigant crop.
3. Fallow – 3 months fallow before planting.
4. Tuber tests for disease states, before planting (PLRV, Rhizoctonia, Black Dot, Verticillium and others)
5. Treat tubers with fungicides, e.g. Maxim.
6. Thoroughly clean machinery – before use.
7. Apply other treatment, if necessary, at planting, e.g. Thimet.
8. Monitor and test for pests and diseases on a regular basis, e.g. TSWV, Thrips, PLRV, Rhizoctonia and others.
9. At harvest – test 400 tuber lot samples for disease, particularly PLRV.
10. Clean equipment and storage facilities.

Descriptions of the project have also been documented in Potato Australia.



## **RECOMMENDATIONS**

1. Restrictions on the importation of potatoes on to Kangaroo Island should continue.
2. Growers should be encouraged to continue testing planting material for presence of disease before planting and for PLRV and other virus on the seed crop.
3. Further investigations are urgently needed to develop management practices for the control of black scurf.

## **ACKNOWLEDGMENTS**

We wish to thank the potato growers of Kangaroo Island for their cooperation in undertaking these studies. In particular, Messrs. P. MacGill and I. Pratt.

We also thank the S.A. Potato Industry Trust Fund and Southern Choice for providing additional funding for this project.