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**Hort Innovation R&D project number: VG15010**

Project VG15010 will provide Australian vegetable growers with the tools and solutions to manage the risk of crop losses due to soil-borne diseases in the major vegetable growing regions in Australia.

- **Process improvements for preserving peak freshness of broccoli (Stage 2)**

**Hort Innovation R&D project number: VG14062**

Project VG14062 is evaluating the cost efficiency of different cooling methods for preserving the peak freshness of broccoli.





## A multi-faceted approach to soil-borne disease management

### Facilitators:

Project VG15010 is being conducted by Project Leader Dr Gordon Rogers, from Applied Horticultural Research.

### Introduction

Soil-borne diseases are a major threat to vegetable produce in intensive cropping systems, costing Australia's \$4 billion vegetable industry around \$120 million per annum.

At the same time, management of soil-borne diseases has become more difficult with fewer chemical control options, more intensive rotations and consumer demand for "perfect" produce.

It is not surprising then, that growers and their advisers have identified soil-borne diseases as the main challenge for soil management and crop protection.

A three-year project will provide Australian vegetable growers with the tools and solutions they need to manage the risk of crop losses due to soil-borne diseases in the major vegetable growing regions of Australia.

The project (VG15010), which commenced in November last year, will be guided by a panel of growers and industry specialists under the management of Dr Gordon Rogers from Applied Horticultural Research and Dr Doris Blaesing from RMCG.

"The Australian vegetable industry has invested heavily in soil-borne disease research in the past decade or so, but despite these efforts, effective management of soil-borne diseases remains the

number one soil-related issue identified by growers," Dr Rogers said.

"Previous research (VG11035) identified five key soil-borne disease groups that continue to challenge Australian vegetable growers – these are *Sclerotinia*, *Fusarium*, Water moulds, Nematodes and *Rhizoctonia*.

"The same diseases were identified as major issues in recent grower and adviser surveys, which clearly demonstrates that a new approach is needed to give growers the tools, information and skills to effectively manage these soil-borne diseases."

Dr Rogers said the project would use the successful extension and delivery framework already developed under the Soil Wealth (VG13076) and Integrated Crop Protection (ICP, VG13078) projects to deliver a "truly effective" soil-borne disease management service to Australian growers.

"By drawing on the added research and economic skills, we will be able to fill in the gaps in soil-borne disease management knowledge, which growers and advisers urgently need to minimise financial risk from soil-borne diseases," he said.

Dr Len Tesoriero, Senior Plant Pathologist with the NSW Department of Primary Industries, will be leading the research component of the project, while Kym White, an economist with RMCG, will concentrate on new tools for the economic risk assessment as needs are identified.

### Key Activities

The Soil Wealth and ICP projects, jointly led by AHR and RMCG, have created a new national framework for the delivery of soil and crop protection information to Australian vegetable growers.

The current project will build on this existing framework, which includes new resources and communication approaches that are expected to facilitate the adoption of existing – and new – soil-borne disease management practices.

"These range from field demonstrations and farm walks with leading Australian growers to instructional videos, fact-sheets and how-to-guides produced on each of the soil-borne disease and crop combinations," Dr Rogers said.

"The how-to guides will focus on broader solutions that apply across regions and crops, while the fact sheets will be more specific."

Dr Rogers said a component of the project would also address social and multimedia content.

"The Soil Wealth and ICP website ([www.soilhealth.com.au](http://www.soilhealth.com.au)) will be extended to include soil-borne diseases and Facebook sites will be set up for all new demonstration sites to enable growers and agronomists to follow progress," he said.

Other activities proposed include regional workshops and interest groups, a network comprising 1,500 growers, agronomists, resellers and chemical companies interested in soil-borne disease management, as well as webinars, reports and articles.



A soil-borne disease master class held in September 2015 attracted 25 growers and advisers who heard cutting-edge advice on managing soil-borne disease in a variety of vegetable production systems.

A monitoring, evaluation, reporting and improvement plan will also be developed and utilised during the project.

“With Kym White’s detailed economic analyses, we expect to have a more accurate assessment of the value of this project, as well as the chance to communicate the benefits of improved soil-borne disease management options,” Dr Rogers said.

## Acknowledgements

This project has been funded by Horticulture Innovation Australia Limited using the National Vegetable Levy and funds from the Australian Government.

### THE BOTTOM LINE: VG15010

- Project VG15010 will provide Australian vegetable growers with the tools and solutions they need to manage the risk of crop losses due to soil-borne diseases in the major vegetable growing regions in Australia.
- The added research and economic skills mean the AHR/RMCG and NSW DPI will be able to fill the gaps in soil-borne disease management knowledge, which growers and advisers urgently need to minimise financial risks from soil-borne disease.
- New information will be communicated to growers and advisers through the Soil Wealth and ICP extension framework via the established network of demonstration sites and field days, and well as print and electronic media.



## Process improvements for preserving peak freshness of broccoli (Stage 2)



### Facilitators:

Project VG14062 is being conducted by Dr Jenny Ekman, from Applied Horticultural Research (AHR), with assistance from Dr Gordon Rogers and Emma Winley, also from AHR.

## Introduction

When the Australian vegetable industry commissioned a series of studies on consumer vegetable choices in 2013, broccoli was a popular purchase.

But despite its reputation as a tasty, versatile and nutrient-dense “super food”, broccoli purchases have remained relatively low, hampered by inconsistency in retail quality and shelf life.

“Nutrition and flavour obviously play a major role in consumers’ decision making, but appearance is also extremely important,” said Dr Jenny Ekman, from Applied Horticultural Research (AHR).

## About the project

Project VG14062 is in the second stage of a research project that is identifying process improvements for preserving peak freshness of broccoli.

Stage one of the project, which was recently completed by Dr Ekman and the AHR team, evaluated retail displays to ascertain whether consumer expectations of broccoli were likely to be met.

“The previous study (VG13083) found that refrigerated retail displays averaged around seven degrees Celsius, while ambient

displays were closer to 16 degrees Celsius,” Dr Ekman explained. “However, these averages concealed a huge range of variation and overlap.

“Cold temperatures were no guarantee of quality – some of the highest quality broccoli was purchased from open displays and some of the worst from refrigerated units.

“The results indicated that consumers were likely to be disappointed in broccoli quality at least one shopping trip in four, which is clearly too many.”

With phase two of the project, the focus is on finding ways to improve retail quality of broccoli.

“This work has included an evaluation of other supply chains, including iced versus non-iced systems, and initial tests of storage technologies on packed broccoli,” Dr Ekman said.

Trials have been conducted on farms at Gatton, Queensland to examine the effect of different cooling methods on broccoli quality and storage life.

The effect of delays in delivering harvested broccoli to the pack house for cooling on quality and storage life was also investigated, along with the effect of harvest time on broccoli quality attributes.

After harvest and cooling, packed crates of broccoli were palletised and transported overnight to Sydney for evaluation of storage and shelf life at seven degrees Celsius and 16 degrees Celsius to replicate commercial practice.

## Major findings

Vacuum cooling immediately after harvest and hydrocooling both

retained quality and increased the weight of harvested broccoli.

While part of this initial increase was due to water adhering to the outside of the broccoli, most of the moisture was internalised.

“Broccoli that was held overnight at 16 degrees Celsius before vacuum cooling still had good quality, but weight loss increased,” Dr Ekman said.

In general, quality differences during storage and shelf life were subtle, but there was a definite trend to better quality in broccoli that was vacuum cooled immediately after harvest.

All differences in weight were retained through transport and storage, with increased weight reflected in firmer broccoli at retail. Increased weight also means increased profitability for the grower.

In terms of transportation, Dr Ekman said there was some uncertainty among growers about whether broccoli needed to be delivered to the pack house immediately or whether the process could be delayed.

“Logistically, it can be quite difficult to get broccoli from the field to the pack house immediately,” she said.

“We found that leaving harvested bins of broccoli in the field rather than immediately transporting them to the packing shed increased weight loss by up to six per cent, which is not a profitable outcome.

“We then compared the cost of different cooling methods. Vacuum cooling is by far the most energy efficient, as nearly all of the energy used cools the broccoli, minimising losses to equipment and the external environment.”

Time of harvest also plays a role in broccoli quality.

The greatest gains in weight during cooling were observed in broccoli harvested at 6am, with less increase at 11am and the smallest increase at 4pm. However, broccoli is at its sweetest last thing in the afternoon.

## Next steps

Trials are currently underway in Victoria and Western Australia to test the effectiveness of the SmartFresh In-Box Quality System, a tool for fruit quality management that has scope to be used for broccoli.

“Preliminary SmartFresh trials conducted with broccoli have been really promising – in fact, initial storage quality was just as good as broccoli stored with ice,” Dr Ekman said.

“But unlike ice, the benefits continue after the broccoli is removed from the box and placed on retail display. Less yellowing at retail means happier consumers and better sales for growers.”



### THE BOTTOM LINE: VG14062

- Although a hydro-vacuum cooler represents a major up-front investment, this is offset by reduced energy costs, increased saleable weight of product and better quality post-harvest.
- New technologies such as SmartFresh may provide a cost-effective alternative to ice, helping to deliver fresher broccoli to consumers.

## Acknowledgements

This project has been funded by Horticulture Innovation Australia Limited using the National Vegetable Levy and funds from the Australian Government.

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ISSN: 1449 - 1397

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