

vegenotes





VG14062: PROCESS IMPROVEMENTS FOR PRESERVING PEAK FRESHNESS IN BROCCOLI (STAGE 2)

FACILITATORS:

Project VG14062 was completed by Dr Jenny Ekman from Applied Horticultural Research.

INTRODUCTION

Broccoli has a great image as a healthy, nutritious and flavoursome vegetable. Botanically it is an inflorescence, a rapidly developing head of tiny flower buds with a high respiration rate and few storage reserves. This makes it difficult to transport and store, with yellowing, rots and damage reducing quality – and sales – at retail.

Traditionally, broccoli has been packed in Styrofoam boxes with ice. This keeps broccoli cool and hydrated through the transport chain and looks good when the box is opened.

However, this system has many disadvantages. The power and potable water needed to make ice, extra transport costs and the expense of packaging are negatives for packers. Styrofoam is non-biodegradable as well as difficult to recycle and, if the ice melts, broccoli ends up floating in a rot-inducing soup.

Keeping broccoli green and fresh without ice would therefore seem to have advantages for growers, packers and consumers alike.

ABOUT THE PROJECT

Optimising cooling and packing processes is vital to retain broccoli freshness. Broccoli absorbs 2-5 per cent weight during hydrocooling or hydro-vacuum cooling, which suggests that products added to the water – such as sanitisers, carbohydrates or other products – are also absorbed.

The final stage of project VG14062 *Process improvements for preserving peak freshness of broccoli (Stage 2)*, undertaken by Applied Horticultural Research, tested the effects of adding sanitiser, a carbohydrate source, or an artificial plant cytokinin (a class of plant hormones) to water during cooling. It also tested the effects of the fumigant 'SmartFresh' on broccoli storage and shelf life.

MAJOR FINDINGS

None of the sanitisers tested reduced postharvest development of rots in broccoli that had been infected in the field. Adding sanitisers to hydrocooling water also had no effect on rots, with infection rates remaining low even when pathogens were added to the water.

While broccoli treated with chlorine products was similar to untreated heads, some of the sanitisers tested actually had negative effects on quality. The results suggest that adding sanitisers to hydrocooling water cannot control postharvest rots. However, they may be used to ensure food safety.

Adding carbohydrates such as sucrose and dextrose to the cooling water also failed to improve quality and, in some cases, floret rots increased.

Better results were gained using the artificial plant cytokinin 6-benzylaminopurine (BAP). Adding 50ppm BAP to hydrocooling water increased the time broccoli remained green at seven degrees Celsius from less than two weeks to three weeks. Treating broccoli immediately after harvest, rather than after a delay of several days, returned the best results. Although BAP resembles natural plant cytokinin B, it is a manufactured product. Unfortunately BAP is not currently registered for postharvest application to broccoli.

Perhaps the most exciting results were gained using a new formulation of 1-methylcyclopropene (a synthetic plant growth regulator), marketed as 'SmartFresh'. SmartFresh is already routinely applied to fruit crops such as apples, pears and plums, and it is also registered for use on broccoli. It blocks the product from producing or responding to ethylene, and this reduces ripening, yellowing and other ageing processes.

SmartFresh is normally applied by releasing the fumigant inside a sealed room. A few hours of exposure to as little as 1ppm (0.0001 per cent) is all that is required, with residues undetectable in the treated product.

Unlike apples, large quantities of broccoli are rarely stored, which makes batch application of SmartFresh problematic. However, a new formulation of 1-MCP called 'In-Box' allows sachets of the fumigant to be added directly to packed cartons. When combined with the matched RipeLock liner, results can be impressive.

CONCLUSION

Broccoli treated with SmartFresh was repeatedly found to be as good as or better than broccoli packed in Styrofoam with ice, even if the cool chain was not maintained.

The effects are retained after the broccoli is placed on retail display, as it remains protected from ethylene produced by ripening produce on the shelf.

AgroFresh is now gathering the data required to register the new InBox formulation of 1-MCP for commercial use on broccoli in Australia.

At the same time, other delivery mechanisms are still being developed. While these remain confidential, it is believed these could provide growers and packers with an even easier way to apply SmartFresh during packing of broccoli.

ACKNOWLEDGEMENTS

This project is a strategic levy investment under the Hort Innovation Vegetable Fund.

VG14062 has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.



VG15060: VEGETABLE SNACKING OPTIONS MARKET RESEARCH (STAGE 2)

FACILITATORS:

Project VG15060 was completed by Martin Kneebone from Freshlogic Pty Ltd.

INTRODUCTION

With the value of the snack food market estimated at \$9.3 billion per annum, increasing consumer demand for healthy snacks and increasing the share of this market for vegetable snacks is a potentially lucrative market for Australian vegetable growers.

Given the vegetable industry's annual gross value of production was estimated at \$3.35 billion in 2014-15, capitalising on this market could potentially be very valuable to the industry.

ABOUT THE PROJECT

Project VG15060 *Vegetable snacking options market research (Stage 2)* was conducted by specialist food market researchers Freshlogic, to assist Hort Innovation and the Australian vegetable industry with three key objectives:

- Identify the distribution channels that have potential to deliver vegetable snacks to the point of purchase;
 - Build on the existing understanding of demand for smaller snacking vegetables by providers of seed and plant material by developing a platform for assessing vegetable consumption attributes and suitability for snacking; and
 - Assess and profile the detailed viability of locally-produced vegetables being used in processed shelf-stable snacks.
- This project is a follow-on from a previous study into the snack food market (VG14024), undertaken in 2015 to define the snack-food market and understand opportunities for the vegetable industry and quantify the market size currently devoted to vegetable snacking products (which only amounted to six per cent, as opposed to the fruit industry, which was identified as providing 53 per cent of healthy snack options).

MAJOR FINDINGS

In addition to traditional food outlets and services, alternate distribution channels worthy of consideration for vegetable snack options include vending, education, health and fitness, airlines and the workplace. Other options may also include online specialty and health, recreation and department store channels.

However, there are considerations that must be kept in mind when producing fresh vegetable snacks that are viable through these channels and appealing to consumers. These include ensuring the product:

- is small or bite sized;
- is available in whole form to capitalise on portability and freshness;
- has appealing taste, texture and digestion attributes;

- is able to be eaten in raw and whole form;
 - is able to be consumed on the move; and
 - is able to withstand chain-handling conditions.
- In relation to accommodation facilities, for example, which have established supply systems in place, success depends on acceptable product form, with a core challenge being perishability.

A key consideration for growers looking to enter this market is to overcome challenges that come with operating within a competitive, fast-moving consumer goods market.

Growers must contend with a number of issues, including:

- having appropriate understanding of scale of operation, costs and market knowledge;
 - adhering to product and ingredient specifications;
 - gaining acknowledgement of provenance;
 - health and quality integrity; and
 - logistical barriers, such as cost, handling and perishability.
- Applying the findings to the Australian market, leading vegetable snack products often require ingredients that have been specifically grown to meet certain product parameters. However, feedback on the implications of this research for vegetable growers proved positive, as many distribution channels would welcome increased vegetable snacking options to satisfy increasing demand for vegetable snacks.

CONCLUSION

For the industry to take advantage of the potential market opportunities for vegetable snacks, it needs to focus on the following:

- offering convenience and mobility of produce;
- premium quality;
- sophisticated packaging and broad-appeal marketing;
- provenance and health acknowledgement; and
- incorporation of lifestyle and ethical attributes.

For growers to successfully enter the snacking market, key considerations include understanding market demand and supply chain dynamics; scale, cost and other barriers to entry; product specification requirements; well-designed marketing; and favourable logistical barriers.

ACKNOWLEDGEMENTS

This project is a strategic levy investment under the Hort Innovation Vegetable Fund.

VG15060 has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.



THE BOTTOM LINE: PROCESS IMPROVEMENTS FOR PRESERVING PEAK FRESHNESS IN BROCCOLI – STAGE 2 (VG14062)

Keeping broccoli green and fresh without ice appears to have many advantages for growers, packers and consumers alike.

The final stage of project VG14062 tested the effects of adding sanitiser, a carbohydrate source, or an artificial plant cytokinin to water to optimise cooling and packing processes of broccoli.

It was found that none of the sanitisers tested reduced postharvest development of rots in broccoli that had been infected in the field, and adding sanitisers to hydrocooling water also had no effect.

However, adding the artificial plant cytokinin 6-benzylaminopurine (BAP) to hydrocooling water increased the time broccoli remained green at seven degrees Celsius from less than two weeks to three weeks.

The most promising results were delivered by using a synthetic plant growth regulator marketed as 'SmartFresh'. Broccoli treated with SmartFresh was repeatedly found to be as good as or better than broccoli packed in Styrofoam with ice, and there is now data being collected to register the new InBox formulation of 1-MCP for commercial use on broccoli in Australia.

FURTHER INFORMATION

For more details about the research, please contact Dr Jenny Ekman on 0407 384 285 or at jenny.ekman@ahr.com.au.

THE BOTTOM LINE: VEGETABLE SNACKING OPTIONS MARKET RESEARCH – STAGE 2 (VG15060)

Project VG15060 sought to identify distribution channels that can deliver vegetable snacking options and build on the existing understanding of demand for smaller snacking vegetables by providers of seed and plant material by developing a platform for assessing vegetable consumption attributes and suitability for snacking, and assess and profile the viability of vegetables being used in whole, fresh and processed snacking options.

The project found a range of mainstream and alternate channels worthy of consideration.

It focused on not only being able to function in a fast-moving competitive environment, but also to incorporate scale of operation, positive demand attributes such as provenance, freshness, taste, texture and type as well as overcome logistical barriers and perishability challenges of vegetables used in fresh, whole and processed snacks.

Demand for these snacks is apparent but providers must take mobility of goods, quality ingredients, sophisticated packaging, health, wellness and lifestyle into consideration for successful outcomes.

FURTHER INFORMATION

For more details about the project, please contact Martin Kneebone from Freshlogic on 03 9818 1588 or martin@freshlogic.com.au.

The final report for this project is available on InfoVeg. Readers can search 'VG15060' on the InfoVeg database: ausveg.com.au/infoveg/infoveg-database.

ISSN: 1449 - 1397

Copyright© AUSVEG Ltd and Horticulture Innovation Australia Limited 2017

No part of this publication can be copied or reproduced without the permission of the original authors. *Vegenotes* is produced by AUSVEG Ltd. PO Box 138, Camberwell, Vic, 3124 | Phone: 03 9882 0277 | Fax: 03 9882 6722

This communication has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Project Number: VG15027

Please contact Michelle De'Lisle at AUSVEG via email at michelle.delisle@ausveg.com.au or call 03 9882 0277 to submit topics for potential inclusion in future editions of *Vegenotes*.

AUSVEG

**Hort
Innovation**
Strategic levy investment

**VEGETABLE
FUND**