



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

FV 395

Strategies for broccoli
management to improve quality
and extend storage life

Annual 2013

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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| Project Number: | FV 395 |
| Project Title: | Strategies for broccoli management to improve quality and extend storage life |
| Project Leader: | Dr Richard Colgan |
| Contractor: | University of Greenwich |
| Industry Representative: | Gavin Willerton |
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| Start Date: | 01 April 2011 |
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| Project Cost: | £95,274 |

Headline

- Storage life and shelf-life quality of broccoli cv. Ironman may be improved by:
 - Removing background ethylene via ethylene scrubbing;
 - In-field application of Amistar or Permasect C, or post-harvest application of SmartFresh™, or a combination of Amistar followed by SmartFresh™.
- Chlorophyll fluorescence may be more useful than visual assessments or colour meter readings in detecting changes in product quality.

Background

The aim of this project is to define strategies for pre- and post-harvest management of broccoli to improve quality and extend storage life. The outputs of the project will enable the industry to reduce waste and crop losses both in the field and post-harvest. The strategies tested include: technologies to reduce the concentrations of ethylene in pack-houses and store rooms, particularly evaluating the suitability of ethylene scrubbing technology; the use of the ethylene antagonist SmartFresh™ (1-methylcyclopropene); and the use of pre-harvest chemical treatments to manipulate ethylene production and response by broccoli heads. In addition, the project is investigating the use of chlorophyll fluorescence to assess maturity and shelf-life of broccoli at harvest and thereby to improve the consistency of the harvested crop.

Summary of the project and main conclusions

Implementation of ethylene scrubbing technology on a commercial broccoli store was shown to reduce background ethylene from 400 ppb to ~200 ppb. The benefit in lower ethylene was to maintain the background green colour of broccoli during storage and shelf-life and to reduce weight loss by 1–2%.

In these second year trials, a repeat of Year 1 trials was carried out on the impact on broccoli quality of pre-harvest sprays of Permasect C and Amistar, both used as part of standard crop protection programmes. Results from trials in Year 2 confirm that Amistar has secondary beneficial effects on improving shelf-life quality of broccoli. SmartFresh™ applied at harvest, and a second application after three weeks storage, reduced the onset of senescence during shelf-life (at 18°C), while combining the split application of SmartFresh™ to broccoli treated with Amistar three weeks before harvest was the most effective treatment to reduce the onset of senescence in broccoli. The effectiveness of treatments on reducing senescence is affected by pre-harvest stresses encountered by broccoli during the growing season.

Chlorophyll fluorescence has been used as a tool to study the process of photosynthesis for many decades. Models of the functioning of the photosynthetic system have been used to relate fluorescence characteristics to specific physiological aspects of chloroplasts. The characteristic that appeared to be most sensitive to broccoli senescence was reaction centres/cross-section (RC/CS), which relates to the concentration of functional photosynthetic reaction centres.

Financial benefits

In-field application of Amistar and Permasect C, minimising the build-up of ethylene in the storage environment, post-harvest treatment using SmartFresh™, and a combined treatment of pre-harvest Amistar application followed by post-harvest SmartFresh™ application have all been shown to improve the storage and shelf-life of broccoli. Management of broccoli in this way can keep product quality higher for longer, thereby reducing the need to import broccoli during low UK production times, as well as reducing waste and crop losses.

Action points for growers

Reducing background ethylene in stores can improve storage and shelf-life of broccoli. Use of electric-powered fork-lift trucks in confined storage spaces can help to prevent the build-up of ethylene.

Broccoli product quality can be extended by using a split application of SmartFresh™ at harvest and prior to removal from storage. On crops previously treated with Amistar as a crop protection measure, subsequent application of SmartFresh™ has a secondary additive effect on shelf-life and quality.