



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

TF 201

Improving quality and reducing costs
of Conference pear storage using
SmartFresh™

Annual 2012

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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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HDC is a division of the Agriculture and Horticulture Development Board.

Project Number:	TF 201
Project Title:	Improving quality and reducing costs of Conference pear storage using SmartFresh™
Project Leader:	Dr Richard Colgan
Contractor:	University of Greenwich
Industry Representative:	Nigel Bardsley
Report:	Annual Report 2012
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Previous report/(s):	None
Start Date:	01 August 2011
End Date:	31 July 2013
Project Cost (Total Project Cost):	£32,066 (£53,066)

Headline

From the first year's work, storing Conference beyond the existing six month window appears to be best achieved by using the standard recommended temperatures.

Background and expected deliverables

With the granting of an EAMU for SmartFresh™ (1-MCP) on pears, opportunities exist to explore the modification of existing storage recommendations for Conference pears. Early experience with SmartFresh™ on Conference has found that pears often fail to ripen properly after removal from store and in some cases have lost their ability to respond to ripening cues. Nevertheless subsequent experimental trials conducted on behalf of Agrofresh have indicated that by modifying storage temperature, or reducing application rates from the usual recommended concentration of 625 ppb to 325 ppb, Conference pears retain their ability to ripen. The introduction of a low concentration of external source of ethylene during SmartFresh treatment™ has also produced promising results.

The current recommendations for pear storage require rapid cooling to remove the field-heat and reduce fruit temperature to 4°C within 2-3 days of store loading followed by a further reduction to -1°C within 7-10 days of loading. In some cases rapid cooling to -1°C has been difficult to achieve particularly in older stores. Such low storage temperatures can lead to fruit stalk end shrivel in some stores. To avoid this, bins can be covered but this further increases storage costs.

The introduction of new protocols to counteract the problems associated with SmartFresh™ and delayed ripening, offer the opportunity of further research to improve pear quality and extension of storage-life.

It is worth researching the effect of reducing the dose of SmartFresh™ currently recommended (625 ppb), or to store at higher temperatures than currently recommended. Reducing the dose rate to 325 ppb has been found to be effective where pear maturity is clearly defined and pears are to be marketed after 6 and 9 months storage.

The most effective protocol must evaluate not only the propensity to ripen ex-store, but also the amount of shrivel, background colour and the incidence of rotting, both ex-store and during shelf-life.

The effect on pear storage life of ethylene removal during storage should also be tested.

The project aims to improve fruit quality and reduce costs of Conference pear storage by using SmartFresh™. Key to achieving this aim will be the identification of protocols whereby pears retain their ability to ripen following SmartFresh™ treatment.

Specific objectives are:

1. To identify an optimum method of SmartFresh™ treatment and storage for Conference pears.
 - 1.1 To identify the optimum storage temperature following an application of SmartFresh™.
 - 1.2. To assess the effects of exposure of fruit to low concentrations of external ethylene in conjunction with SmartFresh™ treatment with a view to maximising the benefits of objective 1.1.
 - 1.3. To compare the effect of SmartFresh™ application with ethylene scrubbing during storage.
2. To quantify the economic benefits of the identified optimum method of post-harvest treatment and storage.
3. To disseminate results obtained through publications, the EMRA members day on fruit storage and training days where appropriate.

Summary of the project and main conclusions

Conference pears were harvested from two orchards in Kent on the 1st September 2011 and transported to the Produce Quality Centre at East Malling Research. Fruits were randomized with misshapen, damaged, small and diseased fruits discarded. Fruits were cooled for 48 hours to reach storage temperatures before SmartFresh™ was applied at the temperatures and application rates outlined in the table below, with or without the addition of ethylene. In addition, the use of E⁺ formulated palladium catalyst was also tested:

Treatment	Code	Temperature regime		
		-0.5 to -1°C	0.5 to 1.0°C	1.5 to 2.0°C
Control, no treatment	C	√	√	√
24 h treatment with SmartFresh™ (625 ppb)	A	√	√	√
24 h treatment with SmartFresh™ (625 ppb) in the presence of 300 ppb ethylene.	B1		√	√
24 h treatment with SmartFresh™ (625 ppb) in the presence of 600 ppb ethylene	B2		√	√
24 h treatment with SmartFresh™ (625 ppb) in the presence of 900 ppb ethylene	B3		√	√
24 h treatment with SmartFresh™ (325 ppb)	D	√	√	√
Ethylene scrubbing by E+ (palladium based) throughout storage period	E		√	√

The results from the 2011-2012 season indicate that extending the storage period for Conference pear beyond the existing 6-month window is most likely to be achieved through

storing at lower temperatures of 1°C or less. Two contrasting orchards were included in these trials. The effectiveness of SmartFresh™ varied according to orchard; SmartFresh™-treated fruit from orchard 40 softened at a slower rate.

Storage at 1.5-2.0°C led to a loss of firmness during prolonged storage in both orchards and SmartFresh failed to maintain firmness above the commercially acceptable threshold (60N) after 3 months storage. More importantly, a rapid loss of background green colour was observed in fruit from all treatments stored at 1.5-2.0°C along with a greater incidence of post-harvest rotting in fruit stored beyond 3 months. In addition, internal carbon dioxide injury was present in fruit inspected after 9 months of storage.

The ex-store firmness of pears stored at 0.5-1.0°C and -0.5 to -1.0°C during the first 6 months of CA storage were similar and no treatment differences between SmartFresh and control fruit were observed. Maintaining the firmness of pears in long-term storage required storage at the standard -0.5 to -1.0°C regime. However, there was no significant effect of SmartFresh on ex-store firmness of conference pears during extended periods of storage.

The rate of softening of pears during shelf-life was influenced by SmartFresh™ and the duration of storage. Pears entering shelf-life after 3 months storage exhibited a 1-2 day delay before changes in firmness were observed. Pears treated with SmartFresh™ (625 ppb) softened at a slower rate between 2 and 6 days, with the delay in softening more pronounced in fruits stored at lower temperatures. However, fruits from each treatment reached an eating quality firmness of 1.5 kg by between 5-7 days. Pears entering shelf-life after 6 or 9 months storage showed no delay in softening and at this stage in the storage life SmartFresh was only marginally effective at delaying softening during shelf-life of pears from orchard 40.

Financial benefits

- No financial benefits have been identified from this project to date.

Action points for growers

- No action points have yet been identified.

