Improving melon supply chain handling systems

Scott Ledger
QLD Department of Primary Industries & Fisheries

Project Number: VX04001

VX04001

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Final Project Report

Improving melon supply chain handling systems

VX04001 (30th April 2007)




Scott Ledger

Department of Primary Industries and Fisheries
Queensland

HAL project number: VX04001

Purpose of report:

This document is the final report for the project, "Improving melon supply chain handling systems". It provides information on the methods, results and key findings of project activities and the evaluation of the project outputs and outcomes.

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Media summary

Fruit quality and handling conditions vary considerably between consignments of melons is one of the key findings from the project "Improving melon supply chain handling systems". The aim of the project was to investigate the impact of current handling practices and conditions from harvest to retail sale on melon quality. The project was funded by five melon businesses, Australian Melon Association, Horticulture Australia Ltd and the Queensland Department of Primary Industries and Fisheries.

Consignments of rockmelons and seedless watermelons were monitored from production districts throughout Australia to retail or processing warehouses in Brisbane, Sydney and Bairnsdale in Victoria. The monitoring involved observing and documenting handling practices and monitoring fruit and air temperatures in cartons and bins. Quality was assessed for fruit sampled from cartons and bins at the time of packing and at the destination point.

The monitoring found that each consignment had a different temperature profile and fruit may be exposed to both high and low temperatures. The external appearance of rockmelons deteriorated before any loss of internal quality while the reverse occurred with seedless watermelons. Sunken, discoloured areas and rots start to appear on rockmelons after 2 to 5 days at 20°C. For seedless watermelons, the symptoms of quality loss were floury texture and orange flesh colour.

Simulations trials were undertaken to investigate the impact of handling conditions and practices on melon quality. Damage to the netting of rockmelons during harvesting, grading and packing increased the incidence of skin deterioration at the other end of the supply chain. Holding seedless watermelons at 30°C for longer than 3 days reduced saleable life but fluctuations in temperature between 30°C and 12°C did not affect quality.

Quality guides for rockmelons and watermelons were produced to provide a common language to describe and assess melon quality and to improve communication about quality between members of the supply chain – from seed companies through to retailers.

A survey of project collaborators and non-collaborators found that most respondents (74%) had made changes or plan to make changes to the way they handle melons. Common changes were improving the harvesting system to minimise net damage of rockmelons, increased monitoring of watermelon temperatures to decide when to shift from non-refrigerated to refrigerated transport and using the melon quality guides to improve communication.

Introduction

Enhancing the eating experience for consumers and improving the effectiveness of supply chains to deliver quality product to consumers were high priority areas for improvement identified by the Australian Melon Association (Anon 2003) in their 2003-2008 strategic plan. Consumer research commissioned by the industry and key stakeholders indicated that there was considerable scope to improve consumer satisfaction with melon purchases. For example, one of the market research studies found that consumers were dissatisfied 59% of the time with melon purchases.

Recent research (Rogers 2005) showed that variety selection and growing practices impact on the sweetness of melons (as measured by °Brix). Steps were being taken to improve the sweetness of rockmelons through improved growing practices (better varieties and optimising plant nutrition and irrigation) and using Near Infrared Spectroscopy (NIR) technology to grade for high brix level melons. However, it was not known what effect handling practices in the supply chain were having on eating quality.

For watermelons, there was little knowledge of the importance of precooling and maintaining the cool chain through the supply chain. As with rockmelons, information was lacking on the effect of current handling practices and supply chain conditions on eating quality.

A recent HAL funded project, Better Mangoes (Campbell 2003), found that quality could be lost at any point in the supply chain from production to retail sale, and the actual conditions that fruit experience within the supply chain differed significantly from what people thought was occurring. Temperature and time in the supply chain were found to be critical factors.

The aim of this project was to identify the impact of current handling practices and conditions in the supply chain on melon quality and to develop recommendations for improving the delivery of high eating quality melons to consumers. The project focussed on rockmelons and seedless watermelons. Honeydew was excluded due to significant issues with variety selection and harvest maturity that were beyond the scope of this project.

An expression of interest to collaborate in the project was widely distributed to all industry sectors and five major melon businesses representing a range of supply chains committed to fund and participate in project activities. The project team worked with these five businesses and their supply chain partners to monitor practices, conditions and fruit quality from packing to retail sale and conduct laboratory simulations to determine the impact of the handling conditions on melon quality. Information on key project findings was communicated through a range of methods to project collaborators and the wider melon industry.

The expected outcome was increased knowledge by melon businesses of the impact of current handling practices and conditions in supply chains on melon quality. It was also expected that project collaborators would identify areas for improvement in their supply chains and develop plans for testing and implementing improvements.

Technology transfer strategy and methodologies

A participatory technology development model was used to work with the melon supply chains to identify improved practices and then transfer the knowledge generated to the wider melon industry. The strategy revolves around taking a participatory approach to generating information that builds the knowledge and capacity of supply chains to implement best practice systems.

The participatory approach is based on the following principles that encourage adoption:

- participants have intimate knowledge of their systems,
- practices can be adapted for local situations and specific supply chains, and
- participants have increased ownership of outcomes.

A critical first step is the identification of supply chain businesses that want to deliver high eating quality melons to consumers and are motivated to implement improved systems. This step recognises that for improvement to occur, businesses must first "want" to improve, and then they need to know "how" to improve and have the "means" to improve.

The structure of horticulture supply chains is changing. Trends include the shortening of supply chains, rationalisation of the supply base and product innovation. Changes are being driven by the strategies of the supermarket chains and innovative suppliers positioning their business to consolidate and manage supply and to capture market share with new products. There are several alliances and marketing groups that have formed to consolidate the supply of melons.

Delivering high eating quality melons to consumers requires a commitment from all members of the supply chain and one of the businesses, the supply chain captain, must take responsibility to drive improvement. The supply chain captain must be motivated to improve the performance of the supply chain and have the capacity to influence the other members.

The knowledge generated from working with specific supply chains is communicated to the wider industry through a range of methods such as industry newsletters, regional meetings, and national conferences. However, it is unrealistic to expect any significant practice change during the duration of the project beyond the project collaborators.

Critical success factors include:

- selection of collaborators who want to improve the eating experience for consumers and who want to drive improvement in their supply chain,
- a culture within supply chains of working together to improve consumer satisfaction for the mutual benefit of all members,
- people in the supply chain businesses willing to contribute sufficient time to be actively involved in monitoring current practices and planning, implementing and reviewing potential improvements,

- recognition by the major supermarkets (Coles and Woolworths) of the value of delivering high eating quality melons to consumers and being motivated to participate in the project and drive improvement in their supply chains, and
- businesses have the "means" to implement improvements (eg cooling facilities, financial resources).

An expression of interest to collaborate in the project was widely distributed to all industry sectors and five businesses representing a range of supply chains committed to fund and participate in project activities. The activities and methods used are described below.

1. Planning meetings with collaborators

An initial meeting was held with all project collaborators to introduce the research team and confirm the proposed outputs, outcomes and activities. The project team then worked with the different supply chains to plan, implement and review specific activities. Annual planning meetings were held to review project activities and plan the next steps.

2. Monitor practices, conditions and quality from packing to dispatch to retail store

The processes at each step in the supply chain were mapped and critical processes that impact on product quality identified. This was done at the project inception meeting and through personal visits to members of supply chains.

Consignments from major rockmelon and watermelon production districts were monitored to wholesaler or retailer distribution facilities in Brisbane and Sydney and the One Harvest fresh cut factory at Bairnsdale in Victoria. Temperature loggers were placed in a range of positions in pallets and bins at the time of packing and removed at the point of dispatch to retail stores. Information was collected on handling practices and holding periods at each supply chain step.

Fruit was sampled at the time of packing and again at dispatch to retail stores and key internal and external quality attributes monitored such as sweetness (brix level), flavour, texture, disease, and external appearance. The monitoring results were analysed to determine if handling practices and conditions were reducing fruit quality and saleable life and to identify systems that were working effectively. The results were reviewed with the project collaborators and plans developed for testing and implementing improvements.

3. Monitor practices, conditions, and quality in retail stores

Buying staff and store managers from Coles were interviewed to identify key consumer attributes for eating quality and current problems and areas for improvement. During visits to stores, the processes from dispatch from wholesaler or retailer distribution facilities to consumer purchase were mapped and critical processes that impact on product quality identified.

Stock movement, handling practices and conditions and fruit quality were monitored in a Coles supermarket at Chermside, Brisbane during a one week period in March

2005. The results were reviewed with the project collaborators and plans developed for testing and implementing improvements.

4. Simulations to determine the impact of supply chain conditions on melon quality

Using the information generated by the monitoring activities, the effect of simulated conditions such as temperature x time events on melon quality and saleable life were determined. Fruit was assessed for key internal and external quality attributes at the beginning and at various stages during the simulation. The results were analysed to determine if conditions affected quality and saleable life and then reviewed with project collaborators to help develop improvement plans.

5. Communication of information generated

The information generated by the monitoring and simulation activities was communicated to target groups as follows:

- Project collaborators – planning meetings, individual reports, personal visits, email discussion network.
- Melon industry businesses– key findings reported in melon industry newsletters (Melon E-News and Melon News) and Australian Melon Runner magazine, and at regional meetings and the AMA national melon conference.
- HAL and Australian Melon Association – planning meetings, email discussion network, milestone and final project reports.

Activities and results

1. Planning meetings with collaborators

The project commenced with two planning meetings of the project collaborators and the R&D team in September and October 2004. At the first meeting, the collaborators confirmed that the outcomes they wanted were better communication between supply chain members, a common language to describe quality, improved practices and consistency of fruit quality, and ultimately increased sales of melons and profitability for all members of their supply chains.

The collaborators mapped the processes at each step in their supply chain and at the second meeting held in late October, they reviewed the maps and identified the critical processes where quality can be lost and potential causes.

A planning meeting was held with the collaborators and the R&D team on the 7th June 2005 to review progress to date and plan future activities. A summary of key findings was provided to each collaborator and an action plan developed. A final meeting with collaborators was held on the 4th April 2006 to review results from the simulation trials and identify areas for further R&D.

2. Monitor practices, conditions and quality from packing to dispatch to retail store

Instructions were prepared for monitoring of consignments and photographic guides prepared for assessing quality of rockmelons and watermelons. On the job training in assessment methods was provided for the R&D team members during the monitoring of the first consignments from each production district and following the planning meeting in June 2005. The photographic guides for assessing melon were continuously improved as new photographs became available. Revised versions of these assessment guides were provided to project collaborators.

A total of 12 rockmelon and 12 seedless watermelon consignments were monitored. Consignments of rockmelons were monitored from Kununurra in WA, Katherine in NT, Mildura in Victoria, Griffith in NSW and St George, Gumlu and Bundaberg in Qld to Brisbane and Sydney wholesalers. Consignments of seedless watermelons were monitored from Kununurra in WA, Darwin, Katherine and Mataranka in NT, Mildura in Victoria and Chinchilla in Queensland to Gatton, Brisbane and Sydney wholesalers and to the One Harvest fresh cut factory at Bairnsdale in Victoria.

The monitoring involved observing and documenting the handling practices from harvest, measuring fruit and air temperatures during harvest and packing, and placing data loggers in packed cartons and bins to measure temperature during holding and transport. Saleable life at 20°C was assessed for fruit sampled from cartons and bins either at the time of packing or at arrival/ dispatch at the destination point or in both locations where possible.

Key findings – rockmelons

- Precooling before transport is essential – forced air cooling is more effective than air cooling
- Fruit temperatures during transport fluctuate on top of pallets but little change occurs inside the pallet
- External deterioration occurs before internal quality loss – skin deterioration and rots appear after 2-5 days at 20°C
- There is little change in brix, flesh colour, flavour, texture and seed cavity condition after 7 days at 20°C

Seedless watermelons

- Fruit may be exposed to high temperatures above 25°C during non-refrigerated transport and market holding
- Watermelons cool slowly in fibreboard bins
- Internal quality loss occurs before external deterioration
- Holding at 30°C for longer than 3 days reduces saleable life – increases loss of texture and crystalline appearance, and development of orange flesh colour

3. Monitor practices, conditions, and quality in retail stores

Stock movement and fruit quality of rockmelons and seedless watermelons were monitored in a Coles supermarket at Chermside in Brisbane over a 7 day period from the 2nd to 9th March 2005. Each daily delivery was tracked to identify the location and time fruit were held in the store and the amount of fruit sold whole or cut and discarded as wastage. Carry over stock of rockmelons on the retail display was assessed for quality before the display was restocked each day.

The key findings were:

- Skin deterioration of whole rockmelons appeared after 1-2 days on the display shelf – need to remove carry-over rockmelons from the display shelf and use for cut fruit sales the next day.
- Training and supervision is needed to ensure that the amount of cut fruit stock doesn't exceed sales and lead to excessive wastage.
- Packing dates were not present on any rockmelon boxes and some watermelon bins, which limits traceability.

4. Simulation trials

Seedless watermelons – high temperatures

The effect of high temperature on saleable life of seedless watermelons was investigated for a range of simulated supply chain temperature regimes. Seedless watermelons were sampled from 300kg bins from 2 growers. Samples of 10 melons were placed under the following time x temperature regimes:

- 14 days at 20°C
- 3 days at 25°C + 11 days at 20°C
- 5 days at 25°C + 9 days at 20°C

- 3 days at 30°C + 11 days at 20°C
- 5 days at 30°C + 9 days at 20°C
- 7 days at 30°C + 7 days at 20°C

The melons were assessed for quality on the day of sampling and at the end of the holding period (14 days). The most notable loss of internal quality was the development of orange colour in the flesh. The incidence of orange colour was significantly higher in melons held under the simulated regimes than in melons at the time of sampling. There wasn't any significant difference in the incidence of orange colour between any of the simulated regimes. There was a slight loss in flavour for melons held at 30°C for 5 and 7 days for one grower but not for the other grower.

Seedless watermelons – fluctuating temperatures

The effect of fluctuating temperatures on saleable life of seedless watermelons was investigated for a range of simulated supply chain temperature regimes. Seedless watermelons were sampled from 300kg bins from 2 growers. Samples of 10 melons were placed under the following time x temperature regimes.

- 1 day at 30°C + 10 days at 20°C
- 1 day at 30°C + 7 days at 12°C + 3 days at 20°C
- 1 day at 30°C + 3 days at 12°C + 7 days at 20°C
- 1 day at 30°C + 3 days at 12°C + 4 days at 30°C + 3 days at 20°C
- 1 day at 30°C + 3 days at 20°C + 4 days at 30°C + 3 days at 20°C
- 8 days at 30°C + 3 days at 20°C

The melons were assessed for quality on the day of sampling and at the end of the holding period (11 days). The only significant loss of quality occurred when the melons from one grower were held at 30°C for 8 days followed by 3 days at 20°C. There was a slight decrease in texture of melons held under this regime. The was no significant impact on quality of any of the fluctuating temperature regimes.

Rockmelons – handling on farm

To investigate the impact of handling on farm on fruit quality, melons were sampled at different points and assessed for net damage and skin deterioration at intervals of 0, 2, 5 and 7 days at 20°C. The sampling points were (a) at harvest before placing on the harvesting boom, (b) from the top and bottom of a field bin before unloading in the packing shed, (c) after dumping of melons from the field bin onto the packing line, and (d) from single layer packages between palletising. Two farms participated in the study.

The sequential sampling from harvest to packing found that the amount of damage to the netting and subsequent skin deterioration increased the further along the handling system the melons were sampled. The areas of skin deterioration were typically associated with areas of net damage. The highest level of deterioration was present on melons sampled from the tray packages. In contrast, the net damage and subsequent skin deterioration was negligible on melons sampled at harvest.

5. Communication of information generated

Melon quality guides

Photographic assessment guides were produced to assist the assessment of quality during monitoring and simulation trials and to help provide feedback to collaborators. The Australian Melon Association (AMA) requested that the guides be expanded to fulfil their need for product description languages for the various melon types. Extra funding was provided from the collaborators, AMA and HAL to produce quality guides for rockmelons and watermelons.

The purpose of the quality guides is to provide a common language to describe and assess melon quality. They are a tool to improve communication about quality between members of the supply chain – from seed companies through to retailers. The guides can be used to:

- develop product specifications,
- train staff in quality standards,
- check the quality of consignments,
- report on quality problems occurring in the supply chain, and
- evaluate new melon varieties.

Communication to collaborators and industry

The following activities were undertaken to communicate information generated by the project to the collaborators, wider melon industry, AMA, and HAL.

- Planning and review meetings with project collaborators – 4 meetings
- Reports on monitoring activities for collaborators (written and verbal) – 12 rockmelon and 12 watermelon reports
- Reports on simulations trials for collaborators – 1 rockmelon and 2 watermelon reports
- Report on retail monitoring for Coles (written and verbal)
- Progress reports for collaborators distributed through email discussion network – 4 reports
- Regional meetings during March to May 2006 to present key findings – Kununurra, Mildura, Griffiths, Ayr, Gumlu, Bowen, Bundaberg, Chinchilla – total of 45 growers and 25 service providers attended
- Presentation and field day display at Australian Melon Conference – 14-16th Sept 2005 – PowerPoint presentation and paper published in Proceedings of Australian Melon Conference and on AMA website – copy of PowerPoint presentation distributed to project collaborators
- Publications

  Barker L.R., Ledger S.N and Rogers G. 2006. Measuring rockmelon sweetness. DPI&F publication

  Barker L.R. and Ledger S.N. 2007. Rockmelon quality guide. DPI&F publication

  Barker L.R. and Ledger S.N. 2007. Watermelon quality guide. DPI&F publication

- Articles on key findings published in industry newsletters and magazines

  Ledger, S.N. 2004. Improving melon supply chain handling system. Australian Melon Runner magazine. Sept 2004 issue, page 20

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  Ledger, S.N. 2005. Update on melon supply chain project. Melon E-News. Dec 2005 issue

  Ledger, S.N. 2006. Handling on farm affects skin deterioration of rockmelons. Melon News. April 2006 issue, pages 6-7

  Ledger, S.N. 2006. Handling on-farm affects rockmelon skin quality. Good Fruit and Vegetables. Nov 2006 issue, page 25

Evaluation and measurement of outcomes

A telephone survey was conducted by an independent person during June to July 2006 to assess reactions to the project and identify changes in knowledge and practices and benefits gained. A total of 31 people were interviewed – 5 project collaborators, 10 growers who collaborated in monitoring activities, 12 growers who attended regional meetings and 4 wholesalers who did not participate in monitoring activities.

The evaluation results are summarised in Appendix 1. The key findings were:

- The project collaborators participated in more activities than other people – 3-5 activities for project collaborators, 1-4 for grower collaborators, 1-2 for growers attending regional meetings, and 0-2 for wholesalers.
- The activity most recalled by respondents (unprompted) was the monitoring of consignments through supply chains.
- 61% of the respondents were surprised by the results while the others said the results reinforced their existing knowledge – the effect of handling on farm on skin deterioration of rockmelons was the most surprising result.
- The issues most relevant to respondents were the need for a common language to describe quality, temperature management through the supply chain and the effect of handling on farm on skin deterioration of rockmelons.
- 74% of the respondents have made changes or plan to make changes to the way they handle melons – common changes are improving the harvesting system to minimise net damage of rockmelons, using the melon quality guides when available and increased monitoring of watermelon temperatures to decide when to shift from non-refrigerated to refrigerated transport.
- The main barriers to change were cost, time, availability of skilled staff and willingness of supply chain partners to implement changes.
- 81% of the respondents expected to gain benefits from the project – improved quality and shelf life were the most common benefits expected.

Tables 1 and 2 below provide an assessment of how effective the project was in achieving the desired outcomes. Table 1 provides an assessment of the original outcomes described in the project proposal while Table 2 provides an assessment of the outcomes agreed to by the collaborators at the project inception meeting.

Table 1. Assessment of the original outcomes described in the project proposal

Project outcome	**Outcome achievement**
By June 2006, all project collaborators have identified areas for improvement and taken actions to improve the performance of their supply chains in delivering high eating quality melons to consumers.	At the time of the telephone survey, 4 collaborators had changed or planned to change the way melons are handled. Examples were using the melon guides when available, working with supply chain partners to ensure consistent temperatures, and changed temperature specifications for watermelons. The other collaborator had not changed practices but had identified issues relevant to his business.
Rockmelons – by June 2006, each case study supply chain had achieved an average brix level of 11% for fruit delivered to retail customers.	Monitoring of consignments showed that brix levels for both rockmelon and watermelon did not decrease during supply chain handling. The major factors affecting brix level are variety and agronomic practices. As these factors were outside the project scope, the activities had no impact on achieving this outcome.
Seedless watermelons – by June 2006, each case study supply chain has reduced the incidence of quality loss by 10%.	Monitoring of consignments did not identify any consistent loss of quality. Losses occurred in some consignments but not others. High fruit temperatures during transport in hot weather were identified and loss of saleable life occurred if the duration was more than 3 days. Expecting a 10% reduction in quality loss proved to be unrealistic.
By June 2006, members of 10 non-case study supply chains have gained knowledge of the impact of handling practices and conditions in supply chains on melon quality	The telephone survey found that 8 growers who attended the regional meetings were surprised by the project results and the other 4 growers said the results reinforced their existing knowledge. The most surprising results were the effect of handling on farm on skin deterioration of rockmelons and how quickly deterioration occurs after net damage. The issues most relevant to their business were the effect of handling from harvest to packing of rockmelon quality and the effect of temperature on watermelon quality.

Table 1. Assessment of the outcomes agreed to by the collaborators at the project inception meeting

Project outcome	**Outcome achievement**
Better communication between all members of the case study supply chains.	The melon quality guides were produced as a tool to improve communication. Each collaborator indicated that they plan to use the guides both within in their business and with their supply chain partners.
Common language to describe quality and a common understanding of the language by all members of the case study supply chains.	The melon quality guides provide a common language to describe and assess melon quality. The collaborators were actively involved in the design of the guides, both content and format, and the needs of growers and service providers were assessed at the regional meetings. Sufficient copies of the guides were provided to each collaborator for use in their business and for distribution to supply chain partners. Copies have also been provided to AMA for distribution to the wider melon industry.
Standards for product specifications developed for case study supply chains.	The production of the melon quality guides has enabled the collaborators to review their product specifications and modify if necessary. Discussions were held with Coles about possible modifications to their specifications.
Better understanding by all members of the case study chains of what is happening in their supply chain and critical factors affecting melon quality.	The telephone survey found that 80% of the project collaborators and 50% of the growers who collaborated with monitoring activities were surprised by the project results. The other project collaborators and growers said the results reinforced their existing knowledge.
Steps taken by all case study supply chains to improve current practices and consistency of fruit quality.	At the time of the telephone survey, 4 collaborators had changed or planned to change the way melons are handled. Examples were using the melon guides when available, working with supply chain partners to ensure consistent temperatures, and changed temperature specifications for watermelons. The other collaborator had not changed practices but had identified issues relevant to his business.
Increased sales of melons and profitability for all members of the case study supply chains.	This outcome proved to be unrealistic as sales and profitability are affected by factors outside the scope of the project.

Discussion

What worked well and why?

- The “want to, how to, means to” model for improvement was effective. For improvement to occur, a business must want to improve (motivation), know how to improve (knowledge), and have the means to improve (capacity). Project activities were focussed on stimulating the “want to” and “how to” improve.
- Working with supply chain captains worked well. These businesses have the capacity to influence change in their supply chains.
- Participatory approach to project activities was critical. This works because it focuses on real needs (problems and opportunities), delivers practical solutions, and increases ownership of results.
- Developing a common language to describe quality was successful. This improves communication between supply chain partners.
- Using multiply methods to communicate project results was effective. People learn in different ways.

What constraints limited achievement of project outcomes?

- Finding enough melon businesses to sponsor the project. There was a general reluctance to invest in the R&D project. People either didn’t believe there was a need to improve (lack of the want to improve) or didn’t believe they would get value for money or maybe didn’t want to share learnings with others.
- Stimulating growers to attend regional meetings. Timing was not right for some growers (clashed with farm activities) and there may have been a low motivation to improve (want to).
- The lack of a supply chain approach in the melon industry to deliver value and satisfaction to consumers and profitability for all members of the supply chain. This still remains the greatest barrier to improving supply chain handling systems and delivering high eating quality melons to consumers. Improvements to supply chains will continue to be limited unless there is a major change in attitudes and aspirations.

Recommendations

Future R&D needs

Rockmelons

- Assess the impact of different harvesting and handling systems on net damage and skin deterioration.
- Develop technology for hot washing brushing for disease control.
- Identify consumer expectations for the quality attributes described in the melon quality guides.

Seedless watermelons

- Investigate the effect of high temperatures on bruising and cracking and loss of texture and flesh appearance.
- Investigate the effect of production practices on flesh redness.
- Assess the impact of maturity on flesh quality – redness, orangeness, texture, saleable life.

General

- Prepare a honeydew quality guide
- Assist the supermarket chains to refine product specifications.
- Identify requirements of food service customers.

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- One Harvest
- S&L Fruit and Vegetable Trading Co.
- Perfection Fresh Australia
- Coles
- Syngenta Seeds – Australia.

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The R&D team members were:

- Scott Ledger, Leigh Barker, Jodie Campbell, Rod Jordan, Sue Heisswolf, and Ross Wright from DPI&F Qld
- Gordon Rogers, Applied Horticultural Research
- Gerard Kelly, NSW DPI
- Sally-Ann Henderson, DPI Victoria
- Julie Bird, DPIF&M NT
- Jodie Hawley, Agriculture WA

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Appendix 1 – Evaluation results

Participation in project activities

Respondent	Number of project activities			
	Project collaborators	**Growers who collaborated with monitoring**	**Growers who attended regional meeting**	**Wholesaler**
1	5	1	2	2
2	5	3	1	2
3	4	3	1	0
4	3	4	1	0
5	3	3	2	
6		2	2	
7		3	1	
8		2	2	
9		4	1	
10		1	2	
11			2	
12			1	
Mean	4.0	2.6	1.5	1.0
Range	3-5	1-4	1-2	0-2

Project activities:

1. Monitoring of loads through supply chain
2. Monitoring of handling on farm
3. Monitoring of retail handling
4. Visit from R&D team member to explain project results
5. Australian Melon Conference, Townsville, Sept 2005
6. Regional meetings during April-May 2006
7. Read articles in Melon E-News, Melon News or Melon Runner
8. Project planning and review meetings

Recall of project activities

Activities	Number and percentage of respondents			
	Project collaborator	**Growers who collaborated with monitoring**	**Growers who attended regional meeting**	**Wholesaler**
Monitoring of loads through supply chain	5 100%	10 100%	8 67%	2 50%
Monitoring handling on farm	1 20%	3 30%	6 50%	0
Monitoring of retail handling	1 20%	1 10%	0	0
Simulation trials	1 20%	1 10%	0	0
Assessing brix variability	1 20%	0	2 17%	0
Postharvest disease control	0	0	1 8%	0
Melon quality guides	1 20%	0	0	0
Project planning and review meetings	2 40%	0	0	0

Surprised by results

Results	Number and percentage of respondents			
	Project collaborator	**Growers who collaborated with monitoring**	**Growers who attended regional meeting**	**Wholesaler**
Rockmelons – effect of handling on farm on skin deterioration	1 20%	2 20%	7 58%	0
Rockmelon – how quickly deterioration/breakdown occurs after net damage			3 25%	0
Effect of poor handling and temp in supply chain	1 20%	0	0	0
Consistency of temperature more important than actual temp	1 20%	0	0	0
Lack of industry quality assessment guides	1 20%	0	0	0
Variation in methods used to test brix	1 20%	1 10%	1 8%	0
Length of time fruit is held in the supply chain	1 20%	0	0	0
Fruit held at ambient temperature at retail	0	1 10%	0	0
Rockmelon – deteriorates externally before internally	1 20%	0	1 8%	0
Rockmelons – effect of different temperatures	1 20%	0	0	1 25%
Rockmelon - lack of date coding on packages	1 20%	0	0	0
Watermelon – robustness more affected by agronomy than temp	2 40%	0	0	0
Watermelon – deteriorates internal before externally	2 40%	0	1 8%	0
Watermelon – effect of practices on cracking	1 20%	0	0	0
Watermelon – fruit hotter on one side of truck		1 10%	0	0
Watermelon - temp rise in sun beside pack shed		1 10%	0	0
Watermelon – more bruising than expected		1 10%	1 8%	0
Watermelon – field temp remains in fruit and doesn't change during transport		1 10%	0	0
Watermelon – better shelf life and less breakdown at some temps.			1 8%	0
No surprises - reinforced existing knowledge	1 20%	5 50%	4 33%	2 50%

Issues relevant to business

Issues	Number and percentage of respondents			
	Project collaborator	**Growers who collaborated with monitoring**	**Growers who attended regional meeting**	**Wholesaler**
Rockmelon – effect of handling from harvest to packing	0	4 40%	8 67%	0
Watermelon – effect of temp – pick fruit during cooler times of day	1 20%	2 20%	3 25%	1 25%
Temp management through chain	0	5 50%	1 8%	1 25%
Need for common language to describe quality	4 80%	0	0	0
Need to standardise method for measuring brix	0	0	2 17%	0
Way we handle fruit along chain	2 40%	0	0	0
Impact of temp on quality	1 20%	0	0	0
Where damage is occurring	1 20%	0	0	0
Length of time in the supply chain	1 20%	0	0	1 25%
Quality control feedback	1 20%	0	0	0
Lack of temp management at retail	0	1 10%	0	0
Monitoring of what is actually happening	0	0	0	1 25%
Rockmelon – hot water treatment for disease control	0	0	1 8%	0
Rockmelon – pick fruit at optimum maturity to maximise brix	0	0	0	1 25%
Reinforced what we do now	0	1 10%	0	0
All relevant	1 20%	1 10%	1 8%	0

Changes to way melons are handled

Changes (completed or planned)	Number and percentage of respondents			
	Project collaborator	**Growers who collaborated with monitoring**	**Growers who attended regional meeting**	**Wholesaler**
Rockmelon – improve harvesting system to minimise damage	0	3 30%	9 75%	0
Rockmelon – improve shed handling systems	0	1 10%	1 8%	0
Plan to use melon quality guides	3 60%	0	0	0
Erected shade cloth on side of pack shed to reduce temp	0	2 20%	0	0
May use temp variation info to determine bin size	1 20%	0	0	0
Using info to train staff	1 20%	0	0	0
Provided guidance to growers on handling practices	1 20%	0	0	0
Working with supply chain partners to ensure consistent temps.	1 20%	0	0	1 25%
Plan to build a new shed in the future and will use info from project	0	1 10%	0	0
Would build new cool rooms and air conditioned shed if had the money	0	1 10%	0	0
Looking at implications for particular varieties	1 20%	0	0	0
Encouraging growers to grow varieties with better eating quality	0	0	0	1 25%
Rockmelon – may investigate hot water dipping	0	0	1 8%	0
Watermelon – changed specs for temp management	1 20%	1 10%	0	0
Watermelon – more temp monitoring of loads to decide when to shift from dry to refrigerated transport	0	2 20%	0	0
Watermelon – probing fruit temps to ensure that fruit is not loaded too hot	0	1 10%	0	0
Not at this time	1 20%	2 20%	3 25%	2 50%

Barriers to making changes

Barriers to change	Number and percentage of respondents			
	Project collaborator	Growers who collaborated with monitoring	Growers who attended regional meeting	Wholesaler
Cost	1 20%	3 30%	3 25%	0
Time	0	3 30%	1 8%	0
Skilled staff		2 20%	0	0
Willingness of supply chain partners to implement changes	2 40%	0	0	0
Picking of melons at right maturity	1 20%	0	0	0
Trying to get changes implemented at store level	1 20%	0	0	0
Getting industry support at farm level	1 20%	0	0	0
Handling large volumes	0	0	1 8%	0
Watermelons - retailers not accepting changes to temp specs	1 20%	1 10%	0	0
Watermelons – red dirt on fruit from dew if pick in morning to reduce temp.	0	0	2 17%	0

Benefits gained – actual or expected

Benefits (actual or expected)	**Number and percentage of respondents**			
	Project collaborator	**Growers who collaborated with monitoring**	**Growers who attended regional meeting**	**Wholesaler**
Improved quality and shelf life – eg less handling damage, better appearance, less wastage, less breakdown, higher packouts	2 40%	6 60%	9 75%	1 25%
Potential for more consistent and higher quality at retail – to increase consumer repeat purchases	2 40%	0	0	0
Better communication with supply chain partners with melon quality guides and standard method to measure brix	1 20%	0	0	1 25%
Increased sales and better market penetration	0	0	0	1 25%
Watermelon - cost efficiencies with streamlining of supply chain - less cooling required	1 20%	1 10%	0	0
None – already doing good practices	0	3 30%	3 25%	0

Other comments

Other comments	Number and percentage of respondents			
	Project collaborator	Growers who collaborated with monitoring	Growers who attended regional meeting	Wholesaler
Project was valuable/ worthwhile/ good value for money/ money well spent/ useful practical information	5 100%	5 50%	5 42%	2 50%
Research team were methodical, professional, and approachable	1 20%	0	0	0
Publishing the melon quality guides will be useful	1 20%	1 10%	2 17%	0
Would have liked in store sampling on a broader scale	1 20%	0	0	0
Project targeted wrong people (professional growers) – results are good for new growers or those getting up to speed	0	1 10%	0	0
Would be good to do similar trials across varieties to determine differences	0	1 10%	0	0
Repeat monitoring of watermelons during hotter periods	0	1 10%	0	0
Nervous about brix measurement – retailers don't care when not much fruit around	0	0	1 8%	0
Don't rely on brix – rely on tasting the fruit – fruit may have high brix but taste terrible	0	0	0	1 25%

Interview Questionnaire

Improving Melon Supply Chain Handling Systems

Name and position

Business type

Grower □
Wholesaler/ marketer □
Retailer □

Business contact details

What types of melons do you grow or handle?

Rockmelon □
Watermelon □
Honeydew □

What activities did you participate in during the project?

Monitoring of loads through supply chain □
Monitoring of handling on farm □
Monitoring of retail handling □
Visit from R&D team member to explain project results □
Australian Melon Conference, Townsville, Sept 2005 □
Regional meetings during April-May 2006 □
Read articles in Melon E-News, Melon News or Melon Runner □

1. *What happened during project?*

What can you remember happened during the project?

2. *What did you learn from the project?*

Were you surprised about any of the project results?

What things were particularly relevant to your business?

3. Practice change

Have you made any changes or planning to make changes to the way you handle melons?

Is there anything that may stop you from making changes to the way you handle melons?

4. Benefits

What benefits have you gained or expect to gain from these changes?

5. Other comments

Are there any other comments you would like to make about the project?

Thank you