

Final Report

Melon food safety – monitoring and support

Project leader:

Dr Sukhvinder Pal (SP) Singh

Report authors:

Dr Sukhvinder Pal (SP) Singh

Delivery partner:

NSW Department of Primary Industries

Project code:

VM20005

Project:

Melon food safety – monitoring and support (VM20005)

Disclaimer:

Horticulture Innovation Australia Limited (Hort Innovation) makes no representations and expressly disclaims all warranties (to the extent permitted by law) about the accuracy, completeness, or currency of information in this Final Report.

Users of this Final Report should take independent action to confirm any information in this Final Report before relying on that information in any way.

Reliance on any information provided by Hort Innovation is entirely at your own risk. Hort Innovation is not responsible for, and will not be liable for, any loss, damage, claim, expense, cost (including legal costs) or other liability arising in any way (including from Hort Innovation or any other person's negligence or otherwise) from your use or non-use of the Final Report or from reliance on information contained in the Final Report or that Hort Innovation provides to you by any other means.

Funding statement:

This project has been funded by Hort Innovation, using the melon 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.

Publishing details:

Published and distributed by: Hort Innovation

Level 7
141 Walker Street
North Sydney NSW 2060

Telephone: (02) 8295 2300

www.horticulture.com.au

© Copyright 2024 Horticulture Innovation Australia Limited

Contents

Contents	3
Public summary.....	4
Keywords	4
Introduction.....	5
Methodology	6
Results and discussion	9
Outputs.....	15
Outcomes.....	18
Monitoring and evaluation	21
Recommendations.....	23
Refereed scientific publications	24
Journal article.....	24
Refereed technical articles.....	24
References	24
Intellectual property	24

Public summary

This project (VM20005 – Melon food safety – monitoring and support) aimed to build a strong food safety culture within the melon industry by providing a food safety testing and environmental monitoring program. Developing and nurturing the food safety culture across the melon supply chain has been the ongoing aim of the 'Safe Melons' program, which commenced in 2015. This national program follows a whole-of-the-chain approach targeting a range of stakeholders, including growers, packers, exporters, regulators, and supermarkets. This project was critical to support the program's activities to ensure the adoption rate of improved food safety practices within the industry were maintained. Successful management of food safety risks is the key to consistently delivering safe fruit and maintaining consumers and trading partners' confidence in Australian melons. In this project we increased the impact of investment into melon food safety through both proactive and reactive approaches based on both food safety monitoring and scientific evidence-based support. A confidential microbial food safety surveillance program was undertaken as an early warning mechanism to predict food safety failure threats and manage them before they turned into a crisis. During August 2021 to June 2024, the project delivered direct benefits to 149 melon growers through the food safety monitoring and support program. These growers were distributed as follows: 67 in WA, 56 in Queensland, 13 in NSW, 5 each in the NT and SA, and 3 in Victoria. A total of 4,799 microbiological samples were collected over three years, 23% higher than the target of 3,900. Samples were collected from melon production fields, packhouses, wholesale, and retail locations in 153 sampling events, that is on an average one sampling event per week for three years. Proactive and reactive surveillance provided risk profiles at individual grower, regional and national levels. Food safety data generated by the project was shared within the industry and overall food safety trends were shared with state food/health regulators to enhance their knowledge of the melon industry's stewardship in this area. The surveillance program, combined with traceback investigations and root-cause analyses, assisted growers and packers in identifying sources and routes of contamination in their production and processing facilities. The 'support' component focused on increasing the food safety knowledge of growers and converting this knowledge into practice and behavioural change, enhancing the industry's food safety culture. This was delivered via site visits and one-on-one consultation with 42 melon growers across Australia. Fourteen technical presentations were delivered at regional workshops and roadshow events attended by approximately 200 participants. Five invited presentations were delivered in scientific conferences and symposia engaging an audience of about 400. Approximately 250 stakeholders from regulatory, policy and standards settings were given four presentations on the industry's food safety status and preparedness. Technical articles (12) were published and disseminated to the industry in response to ongoing and emerging challenges. A food safety helpdesk service was offered to all supply chain participants, including regulators, to address their melon food safety enquiries (engaging about 204 individuals). The key project outcome was food safety risk management solutions delivered to the Australian melon industry that were in line with the melon industry's practices and aligned with the industry's strategic investment plan to effectively manage risks and increase consumption of melons. The success of this current (VM20005) and past projects (VM17002 and VM18003) can be attributed to the whole-of-the-chain approach with a unique functioning model where public-private partnerships have evolved to manage the risks through an industry-supported program. The program engaged with >99% of commercial melon growers nationally and provided risk mitigation services that are fundamental to the sustainability and profitability of the melon industry. Consequently, the melon industry has achieved 'zero food safety incidents and product recalls' for the sixth consecutive year, which is a remarkable achievement. The project's outputs and outcomes have contributed to meeting key performance indicators of the melon industry's Strategic Investment Plans (2018–2022 and 2022–2026) and the Australian Horticulture Sustainability Framework 'Nourish and Nurture' pillar, which recognises the critical importance of food safety and traceability (Goal 3).

Keywords

Safe melons, foodborne pathogens, surveillance, helpdesk.

Introduction

In 2022–23, melon production was 226,022 tonnes with a farmgate value of \$248 million (Australian Horticulture Statistics Handbook 2022–23). The production volume (and value) of watermelons and rockmelons (including honeydew and speciality melons) was 165,723 tonnes (~\$158 million) and 60,299 tonnes (~\$90 million), respectively. Queensland and NSW are the largest melon-producing states, contributing ~66% of watermelon production and ~70% of rockmelon production. From 2019–2023, melon production increased by 16% (190,024 tonnes to 226,022 tonnes), significantly increasing the gross value from \$152 million to \$248 million. In terms of exports, rockmelons represent 77% (9,912 tonnes) of the total melon export volume (12,809 tonnes) and ~70% (\$19.7%) of the total export value (\$28.5 million). Japan and Singapore are the largest export markets (75% share) for rockmelons, while New Zealand and the UAE are the major watermelon markets (~80% share). There is a strong potential for growth in these markets and diversification into other premium markets.

Food safety failure in 2018 exceeded the melon industry's absorptive and adaptive capacities to deal with it. As a result, small- and medium-scale rockmelon growers changed their cropping patterns due to the market conditions and lack of capital investments required into food safety systems. This led to the rockmelon category within the industry go through a consolidation phase between 2018-2022. However, with the return of favourable market conditions and discontinuation of a large rockmelon farm in North Queensland, the number of rockmelon growers has resurged in Queensland and Western Australia. Overall, the industry's growth in the past five years could be attributed to 'zero food safety incidents and product recalls' between 2018 and 2024. The confidence of consumers in food safety of melons is currently high as shown by a recent consumer survey conducted by Food Standards Australia and New Zealand (FSANZ, 2024).

Regulatory landscape changes

Several foodborne illness outbreaks linked to horticultural products in the recent past have attracted the attention of the general public and regulators. In April 2017, the Australia and New Zealand Ministerial Forum on Food Regulation identified three priority areas for 2017–2021 to strengthen the food safety system. One of these priorities was to reduce foodborne illness, particularly related to *Campylobacter* and *Salmonella*. As part of this, Food Standards Australia and New Zealand (FSANZ) reviewed the Food Standards Code to ensure a consistent approach to through-chain food safety management and developed the Primary Production and Processing (PPP) standard for horticulture products (melons, leafy vegetables and berries). From February 2025, with the implementation of new PPP Standards for melons (4.2.9), the melon industry will be transitioning into a regulatory phase. The early signs show that the implementation of new standards may vary with the state/territory food regulators, requiring additional support and guidance for the industry. The regulatory landscape could affect the number and scale of melon growers depending upon the jurisdiction and how effectively these standards are rolled out without additional burden of compliance. In conclusion, the growth and profitability of the melon industry will be dependent upon risk mitigation, compliance with standards and enhancing exports. Food safety, as it stands in the melon industry's strategic investment plan (2022-2026), is fundamental to sustain and grow melon demand in domestic and export markets.

Safe Melons

'Safe Melons' is an initiative of the NSW Department of Primary Industries and Regional Development (NSW DPIRD) to safeguard the Australian melon industry and consumers against food safety risks. Since its inception in 2015 at the NSW state level and 2018 at the national level, the program's core focus has been to develop and nurture a strong food safety culture in the melon industry. Since 2018, the 'Safe Melons' program has been driven by co-investments (VM17002, VM18003 and VM20005) from Hort Innovation and NSW DPIRD and supported by Melons Australia. This unique partnership model involves all participants in the supply chain, including growers, packers, retailers, regulators, and other agencies.

Melon growers, at the heart of this initiative, have adopted best management practices and rely on science- and data-based food safety risk management. As a result, the program has achieved 'Zero food safety incidents and product recalls' for the sixth consecutive year. This success is attributed to grower engagement and trusted relationships among all program partners who aimed for this outcome. The achievement has been recognised by various other industries within Australia and internationally. In contrast, melons in other countries continue to be implicated in major foodborne illness outbreaks. For example, the 2023 Salmonella outbreak in the USA, linked to cantaloupes, affected 44 states, resulting in 407 cases, 158 hospitalisations, and 6 deaths (US FDA, 2024). Similarly, in 2021, the UK experienced outbreaks of

Salmonella and Shiga-toxin E. coli linked to Galia melons and pre-cut watermelons, respectively (Chan et al., 2023; EFSA, 2021).

Linkages with the past and ongoing investments of Hort Innovation and other organisations

During 2015-17, an Australian Centre for International Agricultural Research (ACIAR) project led by the NSW DPIRD (previously NSW Department of Primary Industries) conducted benchmarking on the melon industry's food safety practices and recommended an action plan through 'Safe Melons'. In the last decade, Hort Innovation's investments have driven continuous improvement in melon/horticulture food safety and communication through a series of projects (VM17002, VM18003, VM19000, VM20005 and VM20007). Hort Innovation's R&D levy investments to strengthen the food safety systems of the industry have contributed to the development and implementation of best practice across the supply chain and helped growers in managing food safety risks effectively. Other projects, such as melon consumer insights (VM18000), crisis and risk management planning for the industry (VM18002) and a literature review on the effective control of Listeria in rockmelons (VM19000) have direct linkages with the food safety investments. The melon industry's communication projects (VM20006 and VM23003) have served as an important vehicle for delivery of project outputs and continued engagement with the industry.

Current project objectives: The project (VM20005) aimed to:

- Identify the farm-to-fork food safety vulnerabilities and addressing them rapidly and effectively through a confidential food safety monitoring and evaluation program;
- Provide technical resources, support and guidance for growers enhance food safety best practice adoption and maintain the industry's performance track-record; and
- Strengthen outreach and networks through site visits, industry forums and conferences and disseminate key findings and project outputs, enriching existing resources and building capacity for food safety management.

Methodology

General approaches

There were broadly two project components- 'monitoring' and 'support'. Ensuring the growers and packers were following best practice in food safety, monitoring played an important role. Fundamentally, we understand that the 'end-point microbiological testing' of fruit or environmental samples is not the solution to address food safety, the crux lies in controlling the 'critical processes' during production and postharvest handling. It is thus important to monitor the food safety practices at farm and in packing sheds to verify the credibility and robustness of food safety systems' ability to mitigate risks.

Sample collection

In this project, a comprehensive food safety sampling plan was followed to cover all melon types from different production regions- Riverina (NSW), Sunraysia (NSW & Vic), Riverland (SA), Perth, Carnarvon and Kununurra (WA), Katherine-Darwin (NT), Ayr-Gumlu, Bundaberg and Chinchilla (Qld). The samples represented various stages of the supply chain (growers, packer, wholesaler, and supermarket retailers). A target of 1,300 samples per year was set with flexibility to accommodate the industry needs depending upon the extreme weather events and traceback investigation requirements. The samples were collected from melon production field (soil, fruit, and harvesting equipment), processing facilities (contact and non-contact surfaces and fruit) and markets (wholesale and retail). The sample collection from the field and processing facilities were targeted towards the beginning of each season from northern or southern production. Similarly, the sampling plan was designed to be inclusive of all melon types produced and supplied by all scales of growers in different production regions.

Laboratory analysis

After receipt in the laboratory, the samples were analysed for the detection of three target pathogens: Listeria monocytogenes, Salmonella species and Shiga-toxin E. coli (O157:H7 of Top-7). Table 1 shows summary of detection and confirmation assays employed during the life of the project.

Table 1. A summary of laboratory assays/protocols employed for the detection and confirmation of target pathogens during August 2021 to June 2024.

Target pathogen(s)	Detection method(s)	Confirmation assay(s)	Percentage (number) of samples analysed using each method
Listeria monocytogenes	RT-PCR (Biorad) (Aug 2021 to Mar2023)	Chromogenic media and rhamnose biochemical test (Aug 2021 to Mar 2023)	64.6% (3102/4799)
	Chromogenic media (Biorad) (Apr 2023 to Jun 2024)	MALDI-TOF (Bruker) (Apr 2023 to Jun 2024)	35.4% (1697/4799)
Salmonella species	RT-PCR (Biorad) (Aug 2021 to Mar '23)	Chromogenic media and latex biochemical test (Aug 2021 to Mar 2023)	64.6% (3102/4799)
	Chromogenic media (Apr 2023 to Jun 2024)	MALDI-TOF (Bruker) (Apr 2023 to Jun 2024)	35.4% (1697/4799)
Shiga-toxin E. coli (STEC)	RT-PCR (O157) Biorad (Aug 2021 to Dec 2022)	Chromogenic media (Aug 2021 to Dec 2022)	46.2% (2218/4799)
	RT-PCR (Top-7 STEC) Biorad (Dec 2022 to Jun 2024)	Chromogenic media (Dec 2022 to Jun 2024)	53.8% (2581/4799)

Our laboratory procured the MALDI-TOF equipment in early 2023 and conducted pilot studies on the comparison of pathogen detection assays for *Listeria monocytogenes* and *Salmonella* using both MALDI-TOF and RT-PCR. The pilot study included different types of produce and environmental samples (360) over three months and showed the equivalence of both platforms without any significant performance differences. As a result, the detection assays for *Listeria monocytogenes* and *Salmonella species* were changed from RT-PCR to MALDI-TOF from April 2023 onwards. From August 2021 to December 2022, only one strain of STEC (H157:H7) was detected using an RT-PCR assay. However, the scope of STEC screening was increased to top 7 strains, in light of the melons linked to an STEC outbreak in the UK.

Reporting and data management

The monitoring results were confidentially shared with the participating growers and/or packers via phone and electronic means and a list of corrective actions and further traceback investigation actioned depending upon the results. The project team applied a decision-making system based on the number of positive detections and sample type from each sampling lot per grower to determine if the contamination was random/one-off or widespread/persistent. This strategy has been effective in timely detection and corrective actions undertaken by melon growers and other supply chain participants. The pathogen isolates were cultured and freeze-dried for whole-genome sequencing (WGS) in the next phase of this project. The resulting datasets generated through the surveillance program were shared with participating growers at individual, regional, state, and national levels. Data handling and management were treated with confidentiality and sensitivity. All data were aggregated and anonymised without identifying individual businesses and regions. The datasets were collected, stored, used, and transferred ethically to ensure it was used for the purposes it was collected. Where possible only industry trends and/or summaries of key findings were provided and reported to Hort Innovation marked 'confidential and sensitive'.

PROJECT ACTIVITY 2: Support program implementation with the provision of technical advice and support in food safety issues across key growing regions.

We conducted a range of support activities (site visits, consultation, helpdesk service, regional forums, conferences, and food safety articles) that continue to reinforce the importance of food safety and utilise existing food safety knowledge, practices and culture amongst growers and value chain stakeholders. We consulted with growers and packing shed staff to ensure adoption of the Food Safety Best Practice Toolbox outcomes and the implementation of the Best Practice Guides developed in previous projects has occurred. Support delivery will be in both face-to-face and virtual modes depending upon the circumstances and needs of the industry.

Site visits and consultation

There are approximately 150-160 commercial melon growers according to our database. However, we estimate that ~30 growers contribute >90% of the Australian melon industry's production and value. During site visits and consultations, following services were delivered:

- Food safety systems reviews
- Production field/processing facility walk-through, microbial hazard assessments and management advice
- Microbiological sample collection from production fields, processing environments and equipment/machinery
- Provide businesses with tailored technical food safety advice to improve their systems in the short-, medium- and long-term.

Webinars/virtual meetings

To liaise with the State Food and Health regulators and FSANZ, a presentation was delivered to the Horticulture Standards Implementation Working Group and their technical queries regarding melon food safety were addressed. In addition, several other stakeholder meetings were attended to share the project outputs and outcomes both nationally and internationally.

Melon food safety helpdesk

All melon industry stakeholders were offered access to a food safety helpdesk service to address their technical enquiries related to food safety. We have been successfully offering this service to the industry and addressing technical enquiries from a broad range of stakeholders including growers, packers, exporters, regulators (local and overseas) and importers for more than six years. Growers have benefitted from the independent and unbiased technical advice we provide when making business decisions about food safety practices.

Conferences and regional industry forums

The melon industry's roadshows were employed as a communication and engagement vehicle to deliver this project. These regional workshops/roadshows offered the opportunity to conduct site visits to the farms and packing sheds to offer technical advice and monitor the implementation of best practice. The technical presentations were delivered with national, state and regional food safety data and trends. In addition to the regional forums, the project outputs were also delivered through national and international conferences and symposia such as Hort Connections 2022, 2023, and 2024, Produce Safety Symposium 2022, Codex Australia Symposium 2024, Food safety and traceability symposium 2022.

Food safety articles

Project updates and information were shared through various channels of communication such as industry magazine (Melon News), and other online information portals such as Melon E-news. At least 2 articles were published in industry relevant comms channels per annum to enhance the food safety knowledge and project activities.

Technical resources

During this project, we continued to develop and deliver technical resources to the industry. Two peer-reviewed PrimeFact sheets were published and communicated to the industry.

PROJECT ACTIVITY 3: With Hort Innovation, establish a project logic and monitoring and evaluation (M&E) plan, to track project delivery and progress. Project delivery risk management plan, including COVID-19 contingency plans.

The project governance model was established as per the requirements of Hort Innovation. The melon industry's strategic industry advisory panel (SIAP) was provided regular updated on the project progress. The project leader provided mid-project and end of project presentations to the SIAP and Melons Australia Board. A stakeholder engagement plan was developed to capture details of the melon food safety monitoring strategy for various production regions and reporting mechanism. The project team's ongoing relationships with the industry were helpful in the continuity of a confidential food safety monitoring activity.

A project risk register was developed and submitted to Hort Innovation to identify the risks and their management plans ensuring smooth delivery of the project. A project monitoring and evaluation (M&E) framework was also developed by the project team.

PROJECT ACTIVITY 4. Liaise with the Australian Melon Association and Hort Innovation to provide relevant communications about the project, to communicate the availability of resources, regional visits and workshops

The project team worked closely with Hort Innovation, Melons Australia and regulators to deliver project communications. The schedule of all proposed visits to packing sheds and roadshows was communicated to the industry through Melons Australia. Our linkages and collaboration with the State Government Agencies and growers' organisations made it possible to deliver the Safe Melon program activities throughout Australia.

PROJECT ACTIVITY 5. Identify opportunities for future R&D investment to ensure ongoing food safety and prevention of foodborne pathogen contamination.

The project had strong stakeholder engagement and ground knowledge of the emerging challenges and opportunities that industry would be facing. The project leader, in consultation with industry representatives, identified future R&D opportunities to ensure the food safety outcomes for the industry are met. The final project report contains recommendations for future R&D to mitigate food safety risks for the melon industry.

Results and discussion

PROJECT ACTIVITY 1: Develop a program of testing and environmental monitoring with regular confidential reporting provided to growers, the melon industry and Hort Innovation.

Scientific evidence- and data-driven approaches to risk management are cost-effective and proactive. Despite a push towards a regulatory framework for some horticultural industries including melons, we envisage that an 'Industry-led Proactive Surveillance' model is more effective than the 'compliance and reactive surveillance' model. The proposed project activity was an ongoing step towards high-throughput surveillance with broader coverage and data generation that can be harnessed to develop tools for predicting and managing food safety risks. The continuation of melon food safety surveillance allowed the industry to prove its track-record and provide a quantitative measure of food safety best practice adoption.

Sample collection

The microbiological samples were collected from various stages of the supply chain (growers, packer, wholesaler, and supermarket retailers). Against the target of 3,900 samples (1,300 per year), 4,799 were collected. The sampling regime covered 149 growers across all melon producing regions, including 67 in WA, 56 in Qld, 13 in NSW, 5 each in SA and NT and 3 in Vic (Figure 1).

Melon food safety surveillance- growers coverage (August 2021- June 2024)

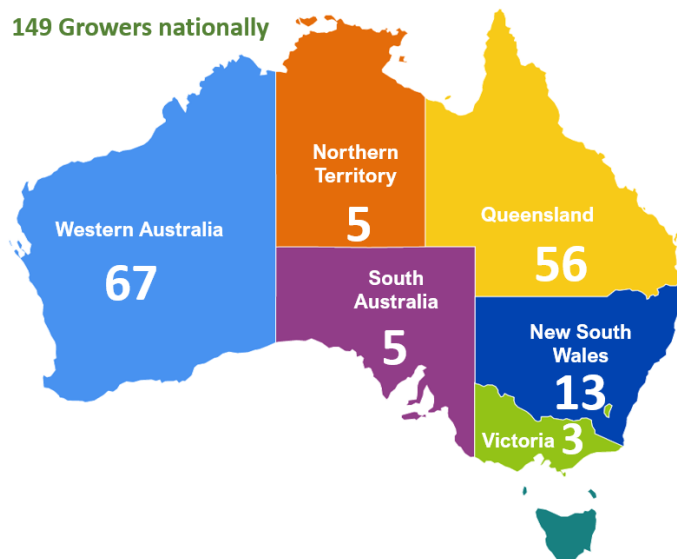


Figure 1. Melon food safety surveillance coverage across Australia, the number of growers represented in sampling from various points in the supply chain.

Out of 4,799 samples collected, 3,637 were fruit samples and 1,162 were environmental samples from field and processing environments (Figure 2). Among 3,637 fruit samples, watermelons and mini watermelons (1,494), rockmelons and honeydew (1,758) and specialty melons (e.g. piel de sapo, orange candy) were represented. Being inclusive of all melon types and growers of various scales is an important characteristic of the surveillance program.

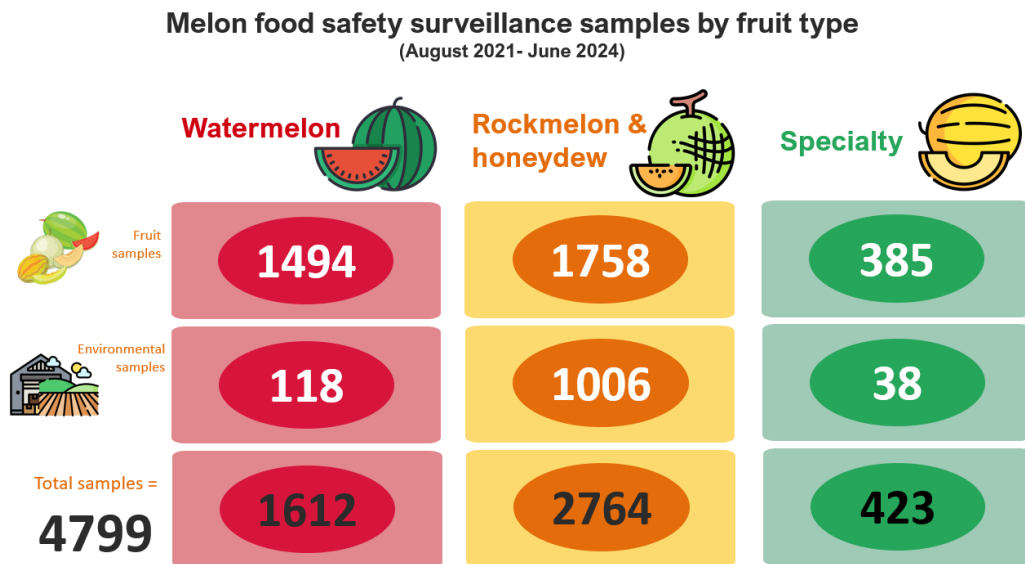


Figure 2. Melon food safety surveillance coverage different types of samples (fruit and environmental samples)

The microbiological sampling was conducted at different points along the supply chain as shown in Figure 3. The sampling scheme depicts all types of sampling locations and types that were captured in this project.

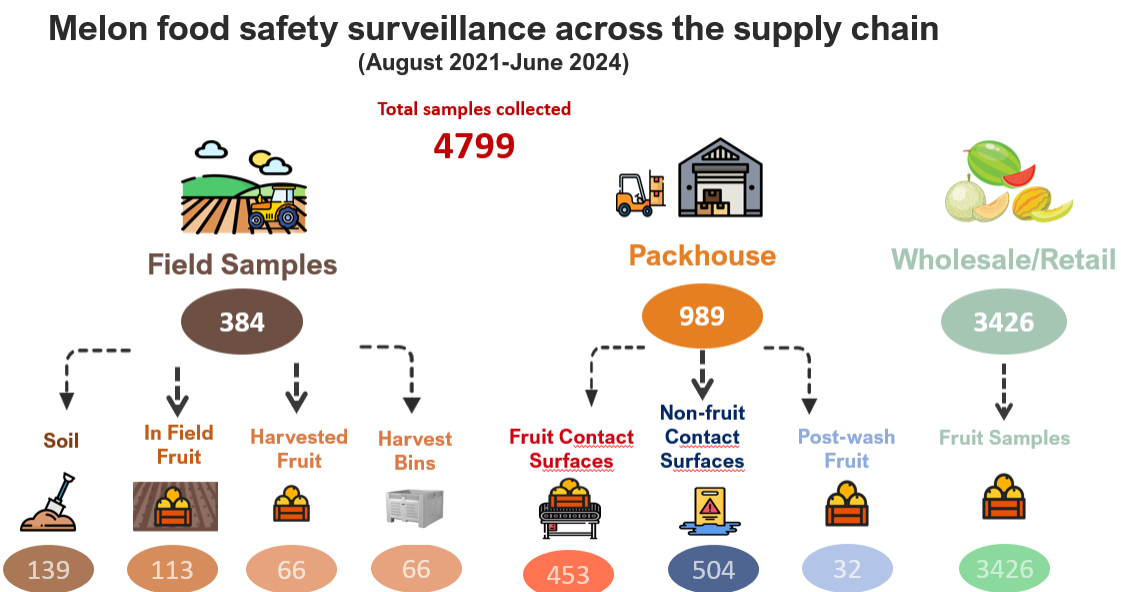


Figure 3. Melon food safety surveillance overview showing the number of samples collected from each point along the supply chain.

During 2021-2024, a total of 153 sampling events have been conducted, that represent one sampling event per week if averaged over the life of the project (152 weeks). The frequency of sampling is an important attribute of our surveillance program to ensure microbial contaminants are potentially detected on time and reported back to growers and other relevant supply chain partners. Wholesale markets represent 47% of sampling events and provides a focal point of information on the number and identity of growers in each state/territory (Figure 4). Retail (19.6%), packing shed (17.6%) and farms (15.7%) represent other sampling events locations.

Melon food safety surveillance sampling events

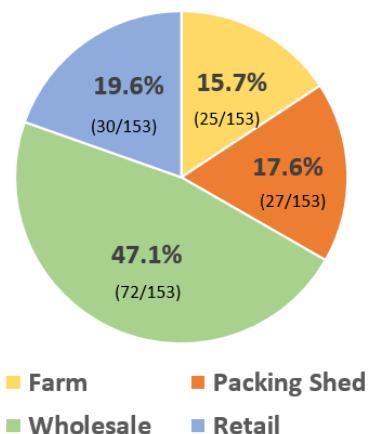


Figure 4. Melon food safety surveillance showing the number of samples events conducted at various points.

Pathogen detection trends

Listeria monocytogenes continues to be the major environmental pathogen of concern followed by *Salmonella* species. However, the industry's preventative controls have been able to disrupt the pathogen transfer from the environment to fruits during production and postharvest processing. Overall, the pathogen detection throughout the project remained within the set targets with infrequent spike in detections linked to extreme weather conditions such as heavy rainfall, flooding and bushfires.

Pairing of pathogen and melon type showed that rockmelons and honeydews presented higher detection of *Listeria monocytogenes* compared to watermelons. Contrarily, watermelons were associated with higher number of *Salmonella* detections compared to rockmelons and honeydews. No pathogen detections were observed in specialty melons (e.g. piel de sapo and orange candy) during August 2021 to June 2024. The positive detections were traced back to growers and packers to conduct root-cause analyses and provide technical advice to manage microbial risks.

The major pathogen detection events along with their high-level response summary are highlighted below:

- Out of 153 sampling events, two events (one each in 2022 and 2023) were ranked 'flagrant' and involved cross contamination with *Listeria monocytogenes*.
- In 2023, one sampling event in response to flooding found contamination of the processing environment with *Listeria monocytogenes* detection from contact and non-contact surfaces.
- In 2021, multiple detections of *Salmonella* were found in the processing environment without any detection on fruit grown and supplied. These detections were followed by extremely wet weather conditions in the region.
- In 2022, *Salmonella* detections on fruit surfaces were linked to the potential wildlife incursion on the farm, leading to development and communication of technical advice to growers on this event.
- There were random contamination events throughout the project which were communicated with relevant growers and their food safety management systems reviewed.

All the above examples highlight how a combination of proactive and reactive surveillance and food safety best practice assists the industry in effectively managing risks. Real-time reporting of microbiological survey results along with technical recommendations have been helping growers and packers in their continuous improvement of food safety and data-based risk management. The surveillance data were aggregated and anonymised at regional, state and national levels for presentations, depending upon the target audience. The case studies on melon growers and packers who have consistently achieved desired food safety outcomes were also presented in regional meetings. In a nutshell, food safety surveillance data has been captured, used and shared with relevant stakeholders for multiple purposes, including performance indication, risk management, championing the food safety leaders and track-record measurements.

PROJECT ACTIVITY 2: Support program implementation with the provision of technical advice and support in food safety issues across key growing regions.

Site visits and consultation

Technical site visits were made to melon growers in the following regions:

- NSW: Griffith-Nericon-Lake Wyangan
- Vic: Mildura-Red Cliff
- SA: Waikerie and Barmera
- Qld: Bundaberg, Ayr and Tully
- NT: Katherine, Douglas Daly and Mataranka
- WA: Kununurra, Broom, Carnarvon, Perth metropolitan and Waroona

Technical presentations to stakeholders

A variety of stakeholders within and outside Australia were engaged and presented the 'Safe Melons' program. A list of presentations is as follows:

- Singh SP, 2024. Exploring food safety and traceability data-sharing opportunities in the horticultural export supply chains. Dubai Municipality (Food Safety Authority) on 19 June 2024 (virtual)
- Singh SP, 2024. Melon food safety and traceability-NT update. Melon Industry R&D Roadshow, Katherine, NT 29 April 2024
- Singh SP, 2024. Melon food safety and traceability-WA and Kimberley region update. Melon Industry R&D Roadshow, Kununurra, WA 26 April 2024
- Singh SP and Davey J, 2024. Melon food safety and traceability-FNQ region update. Melon Industry R&D Roadshow, Tully, Qld 22 April 2024
- Singh SP, 2024. Land-use influences microbial food safety in the horticulture sector. NSW Agricultural Land Use Planning Group meeting on 16 April 2024 (virtual)
- Singh SP, 2024. Melon food safety and traceability-WA and Gascoyne region update. Melon Industry R&D Roadshow, Carnarvon, WA 28 February 2024
- Singh SP, 2024. Melon food safety and traceability-WA and Peel region update. Melon Industry R&D Roadshow, Waroona, WA 27 February 2024
- Singh SP, 2023. NSW DPI's Fresh produce safety and traceability program and Safe Melons lessons. The US Food and Drug Administration and Crème Global on 14 December 2023 (virtual)
- Singh SP, 2023. NSW DPI's Fresh produce safety and traceability program and Safe Melons lessons. Western Growers Association on 5 December 2023 (virtual)
- Singh SP, 2023. Melon food safety and traceability-NSW and Riverina region update update. Melon Industry R&D Roadshow, Griffith NSW 2 November 2023
- Singh SP and Davey J, 2023. Melon food safety and traceability-Sunraysia region update. Melon Industry R&D Roadshow, Mildura, Vic 31 Oct 2023
- Singh SP and Davey J, 2023. Melon food safety and traceability-SA and Riverland region update. Melon Industry R&D Roadshow, Barmera, SA 30 Oct 2023.
- Singh SP, 2023. Australian fresh produce safety- highs and lows. Organised by the Swedish University of Agricultural Sciences, Alnarp, Sweden on 23 May 2023
- Singh SP, 2023. Melon food safety and traceability-NSW update. Melon Industry R&D Roadshow, Griffith, NSW 4 April 2023
- Singh SP, 2023. Melon food safety and traceability- SE Qld update. Melon Industry R&D Roadshow, Bundaberg,

Qld 23 March 2023

- Singh SP, 2022. Melon food safety and traceability- NT update. Melon Industry R&D Roadshow, Katherine, NT 19 Nov 2022.
- Singh SP, 2022. Melon food safety and traceability-Kimberley update. Melon Industry R&D Roadshow, Kununurra, WA 17 Nov 2022.
- Singh SP, 2022. Melon food safety and traceability- FNQ update. Melon Industry R&D Roadshow, Tully, Qld 12 Nov 2022.
- Singh SP, 2022. Melon food safety and traceability- NQ update. Melon Industry R&D Roadshow, Ayr, Qld 10 Nov 2022 (virtual)

Melon food safety helpdesk

Technical enquiries related to food safety were received from melon growers, packers and exporters. Other stakeholders such as supermarkets and regulators also raised enquiries about the project updates. International stakeholders such as importers and regulators sought information about melon food safety and traceability systems in place. State agencies also sought information relevant to melon food safety and PPP standards. It is estimated that more than 200 enquiries via phone and email have been addressed throughout the project and could be categorised into following themes:

- Microbiological testing results for QA schemes
- Wildlife incursions and management
- Organic soil amendments and its implications
- Selection of fertilisers, sanitisers and fungicides
- Postharvest wash water quality, sanitisers and fungicides
- Environmental monitoring program
- Postharvest packaging and decay
- Response to extreme weather events (e.g. flooding and bushfires)
- Primary production and processing (PPP) standards
- Food/health regulators enquiries on potential implications of melons in local illness clusters

Conferences/Symposia

The project outputs and outcomes have been widely presented in the conferences and symposia held by a variety of stakeholders. The list of presentations that included the project outputs is presented below:

- Singh SP, 2024. Food safety preparedness in the horticulture sector. Codex Australia Symposium, Canberra on 11 June 2024 (invited).
- Singh SP, 2024. Mind the gap- what is next in food safety? Hort Connection 2024, Melbourne 5 June 2024 (panel discussion)
- Singh SP, 2023. Safer melons with research and extension. 2023 AIFST Food Microbiology Conference, Sydney on 30 March 2023 (invited)
- Singh SP, 2022. Enabling food safety compliance of the fresh produce industry. Symposium on improving food safety and traceability in the horticulture sector. TropAg International Conference, Brisbane 31 Oct-2 Nov 2022 (invited)
- Singh SP, 2022. Potential impacts of climate change and extreme weather events on the fresh produce safety in Australia. Food Safety and Security Conference 2022, Sydney on 12-14 September 2022 (invited)
- Singh SP, 2022. Fresh produce safety surveillance, monitoring and support for the industry. Australia New Zealand Fresh Produce Safety Conference, Sydney on 11 August 2022 (invited)

Exhibitions

The project was represented through posters and stakeholder engagement during the Hort Connections conferences and exhibitions held during the life of the project. During these events, more than 500 stakeholders were engaged in the exhibition booth.

- Hort Connection 2024, Melbourne 4-6 June 2024
- Hort Connections 2023, Adelaide 5-7 June 2024

Food safety articles

Against a target of 6 technical articles (two per annum), 12 technical articles were published, including three peer-reviewed articles. The list of published articles is as follows:

- Singh SP, 2024. Safe melons program – a new milestone of industry’s achievement. Melon News June 2024.
- Singh SP, 2024. New labelling on cut melons boosts food safety and consumer confidence. Melon News June 2024.
- Singh SP, 2023. Microbial food safety risks associated with producing and processing fresh produce in bushfire-affected regions December 2023, Primefact PUB23/1247, first edition.
<https://www.dpi.nsw.gov.au/agriculture/horticulture/food-safety>
- Singh SP, 2023. Managing floodwater associated food safety risks in melon production and postharvest handling December 2023, Primefact PUB23/1340, first edition.
<https://www.dpi.nsw.gov.au/agriculture/horticulture/food-safety>
- Singh SP and Davey J, 2023. Supporting compliance with Primary Production and Processing (PPP) standards. Melon News December 2023.
- Singh SP, 2023. Flooding adversely impacts fresh produce safety. Microbiology Australia 44(4), 185–189. doi:10.1071/MA23054.
- Singh SP, 2023. Safe melons: better understood, not feared. Melon News June 2023.
- Singh SP, 2023. Melon traceability project and its journey to the national awards of excellence in horticulture. Melons News June 2023.
- Singh SP, 2022. Assess and manage microbial food safety: wildlife and domesticated animals are a source of microbial contamination. Melons News, December 2022.
- Singh SP, 2022. No space for raw animal manures in melon production. Melon E-news October 2022.
- Singh SP, 2022. Melon food safety surveillance, monitoring and support. Melons News, July 2022.
- Singh SP, 2021. Melon food safety surveillance, monitoring and support- VM20005, December 2021.

PROJECT ACTIVITY 3: With Hort Innovation, establish a project logic and monitoring and evaluation (M&E) plan, to track project delivery and progress. Project delivery risk management plan, including COVID-19 contingency plans.

The project monitoring and evaluation activities were regularly conducted throughout the project. At the commencement of the project, a project reference group (PRG) was established to review and provide feedback on the project. After its first meeting in August 2022, it was decided that project governance should be shifted to the Hort Innovations’ melon strategic industry advisory panel (SIAP) considering the strategic nature of the project and avoid duplication of governance. The project leader established a strong communication linkage with Hort Innovation and Melons Australia to deliver a range of activities as outlined in the project M&E plan and stakeholder engagement plan. The following project progress presentations were delivered:

- Singh SP, 2024. The Safe Melons achievements (2021-2024) and what is in the next phase? Melon Fund- Strategic Industry Advisory Panel, Hort Innovation on 18 April 2024 (virtual)
- Singh SP, 2024. The Safe Melons project- past, present and future. Melons Australia Board Meeting, Brisbane 9 April 2024
- Singh SP, 2024. VM20005- The project progress update (Aug 2021-March 2023). Melon Fund- Strategic Industry Advisory Panel, Hort Innovation on 18 April 2023 (virtual)
- Hort Innovation (Bianca Cairns) visit to melon growers and packers in Riverina, NSW 3 April 2023.
- Singh SP, 2022. VM20005- The project progress update. Project reference group (PRG) meeting held on 1 August 2022 (virtual)

PROJECT ACTIVITY 4. Liaise with the Australian Melon Association and Hort Innovation to provide relevant communications about the project, to communicate the availability of resources, regional visits and workshops

The project leader liaised with Melons Australia and Hort Innovation to deliver regional updates, leveraging the melon industry’s communication project and roadshows across Australia. Site visits and technical presentations’ delivery was coordinated and facilitated by Melons Australia. Technical resources and food safety alerts were disseminated to the industry through Melons News and E-news as listed in the project activity 2.

PROJECT ACTIVITY 5. Identify opportunities for future R&D investment to ensure ongoing food safety and prevention of foodborne pathogen contamination.

The project leader, in consultation with industry representatives, identified future R&D opportunities to ensure the food safety outcomes for the industry are met. The R&D recommendations were presented to the melon SIAP for continuation of the 'Safe Melons' program with the aim to develop resilience in the industry to prevent market failures and maintain industry's track-record.

Outputs

Table 2. Output summary

Output	Description	Detail
Project management documentation including a program logic and monitoring and evaluation (M&E) plan with linkage to Hort Innovation and industry/fund objectives; a project risk register; and a project IP register; and a stakeholder engagement plan.	These outputs were developed to ensure the project meets its objectives, delivers anticipated benefits to the industry by optimally utilising resources.	The project management documents including M&E plan were submitted to Hort Innovation at Milestone 102. These were approved and subsequently used for project management purposes, including their usage for reporting to the PRG/SIAP and Hort Innovation.
Milestone reports	Six-monthly milestone reports were prepared to report on the project progress as planned.	Five milestone reports (MS102, MS103, MS104, MS105 and MS106) were submitted to Hort Innovation as per the contract agreement. These reports were aligned with the project monitoring and evaluation plan.
A food safety indicator testing and monitoring program with regular confidential reporting to growers, the melon industry and Hort Innovation.	Food safety surveillance was delivered throughout the project with regular reporting to growers and Hort Innovation via milestone reports	The food safety surveillance data was confidentially reported to individual growers/businesses. The aggregated and anonymised datasets were submitted to Hort Innovation along with six-monthly milestone reports. No breaches of confidentiality were made or brought to our attention throughout the project, allowing continued trust in our data handling and management scheme ensuring brand and reputation protection to participating growers and packers.
A report on industry's food safety performance and data trends based on the target surveillance (1300 samples/year or 3900 LOP) for key foodborne bacterial pathogens (Confidential output)	A total of 4,799 samples (target 3,900) were collected from various points along the supply chain in 153 sampling events, representing 149 melon growers nationally.	The microbial surveillance involved the detection of target pathogens (<i>Salmonella</i> species, <i>Listeria monocytogenes</i> and Shiga-toxin <i>E. coli</i> O157:H7) to determine the nature and magnitude of microbial hazards in the melon supply chain and minimise their impact on consumers and the industry. The follow-up and root-cause analyses were performed to enhance food safety knowledge and minimise the risk of reoccurrence of contamination (APPENDIX I marked confidential and sensitive).
Eight presentations (over LOP) on the project progress	Fourteen technical presentations against the target of eight were	The melon industry's roadshows were delivered at the following locations and on dates as follows: 1. Katherine, NT 29 Apr 2024

delivered through regional forums and workshops organised by Melons Australia, NSW DPI and other organisations	delivered across Australia in melon industry's roadshows, representing engagement with more than 250 participants through these events	<ol style="list-style-type: none"> 2. Kununurra, WA 26 Apr 2024 3. Tully, Qld 22 Apr 2024 4. Carnarvon, WA 28 Feb 2024 5. Waroona, WA 27 Feb 2024 6. Griffith NSW 2 Nov 2023 7. Mildura, Vic 31 Oct 2023 8. Barmera, SA 30 Oct 2023 9. Griffith, NSW 4 Apr 2023 10. Bundaberg, Qld 23 Mar 2023 11. Katherine, NT 19 Nov 2022 12. Kununurra, WA 17 Nov 2022 13. Tully, Qld 12 Nov 2022 14. Ayr, Qld 10 Nov 2022 (virtual)
At least 30 site visits (over LOP) for one-on-one consultation with all melon growers including 15 watermelon, and 15 rockmelon and specialty melons	Forty-two site visits were conducted throughout the project, including 34 conducted during the melon industry's roadshows and 8 visits as part of the response to various sites across NSW (2), Vic (1), WA (2) and Qld (1). These site visits covered 16 rockmelon and specialty melon growers and over 30 watermelon growers.	<p>The site visits conducted during the roadshows at following locations and dates along with number of growers/packers visited (in parentheses):</p> <ol style="list-style-type: none"> 1. Katherine, NT Apr 2024 (3) 2. Kununurra, WA 26 Apr 2024 (3) 3. Carnarvon, WA 28 Feb 2024 (5) 4. Waroona, WA 27 Feb 2024 (3) 5. Griffith NSW 2 Nov 2023 (3) 6. Mildura, Vic 31 Oct 2023 (2) 7. Griffith, NSW 4 Apr 2023 (3) 8. Bundaberg, Qld 23 Mar 2023 (3) 9. Katherine, NT 19 Nov 2022 (3) 10. Kununurra, WA 17 Nov 2022 (3) 11. Tully, Qld 12 Nov 2022 (3)
One presentation to be delivered in a national conference organised by Melons Australia	Melons Australia did not organise their national conference during the project. However, five invited technical presentations were delivered at national conferences in which the project outputs/outcomes were shared with the audience. It is estimated that ~400 participants received these presentations in different events.	<ol style="list-style-type: none"> 1. Mind the gap- what is next in food safety? Hort Connection 2024, Melbourne 5 June 2024 (presentation and panel discussion) 2. Safer melons with research and extension. 2023 AIFST Food Microbiology Conference, Sydney on 30 March 2023 (invited) 3. Enabling food safety compliance of the fresh produce industry. Symposium on improving food safety and traceability in the horticulture sector. TropAg International Conference, Brisbane 31 Oct-2 Nov 2022 (invited) 4. Potential impacts of climate change and extreme weather events on the fresh produce safety in Australia. Food Safety and Security Conference 2022, Sydney on 12-14 September 2022 (invited) 5. Fresh produce safety surveillance, monitoring and support for the industry. Australia New Zealand Fresh Produce Safety Conference, Sydney on 11 August 2022 (invited)
Project exhibitions (not listed in M&E plan)	As part of the stakeholder engagement plan, project posters were displayed in leading industry conferences and exhibitions.	<p>Project posters were displayed, brochures distributed to relevant stakeholders and engagement with diverse stakeholders was achieved at the following industry exhibitions:</p> <ul style="list-style-type: none"> • Hort Connections, Adelaide (June 2023) • Hort Connections, Melbourne (June 2024)
One melon food safety webinar customised for the State Health	Four presentations were delivered to stakeholders from food regulation	<p>Singh SP, 2023. Fresh produce safety and traceability program. NSW Food Authority Annual Meeting, Newcastle on 2 May 2023.</p> <p>Singh SP, 2024. Safe Melons program. Implementation Subcommittee for Food Regulation (ISFR)- State Food and Health</p>

<p>Agencies and Food Regulators to be delivered across all jurisdictions in Australia in 2022</p>	<p>enforcement, standards and policy settings and engaged more than 250 participants.</p>	<p>Regulators Meeting on 18 Sep 2023 (virtual, invited)</p> <p>The presentation highlighted industry’s proactive approach towards preparedness for PPP standards and how project outputs will be relevant to facilitate compliance of growers with the new standards. The meeting was attended by ~30 participants representing all state/territory jurisdictions and a copy of the presentation supplied to all.</p> <p>Singh SP, 2024. Land-use influences microbial food safety in the horticulture sector. NSW Agricultural Land Use Planning Group meeting on 16 April 2024 (virtual).</p> <p>Singh SP, 2024. Food safety preparedness in the horticulture sector. Codex Australia Symposium, Canberra on 11 June 2024 (invited).</p> <p>The Codex Symposium was widely attended by participants from regulatory and policy settings from Australia and New Zealand, including FSANZ, on 11 June 2024. A total of 180 participants (70 face-to-face and 110 virtual) representing 70 organisations were present in this meeting.</p>
<p>Two technical articles to be delivered through Melon News and Melon E-news (one each) annually</p>	<p>Against a target of 6 technical articles (two per annum), 12 technical articles were published, including three peer-reviewed articles.</p>	<p>The list of published articles is as follows:</p> <ul style="list-style-type: none"> • Singh SP, 2024. Safe melons program – a new milestone of industry’s achievement. Melon News June 2024. • Singh SP, 2024. New labelling on cut melons boosts food safety and consumer confidence. Melon News June 2024. • Singh SP, 2023. Microbial food safety risks associated with producing and processing fresh produce in bushfire-affected regions December 2023, Primefact PUB23/1247, first edition. https://www.dpi.nsw.gov.au/agriculture/horticulture/food-safety • Singh SP, 2023. Managing floodwater associated food safety risks in melon production and postharvest handling December 2023, Primefact PUB23/1340, first edition. https://www.dpi.nsw.gov.au/agriculture/horticulture/food-safety • Singh SP and Davey J, 2023. Supporting compliance with Primary Production and Processing (PPP) standards. Melon News December 2023. • Singh SP, 2023. Flooding adversely impacts fresh produce safety. Microbiology Australia 44(4), 185–189. doi:10.1071/MA23054. • Singh SP, 2023. Safe melons: better understood, not feared. Melon News June 2023. • Singh SP, 2023. Melon traceability project and its journey to the national awards of excellence in horticulture. Melons News June 2023. • Singh SP, 2022. Assess and manage microbial food safety: wildlife and domesticated animals are a source of microbial contamination. Melons News, December 2022. • Singh SP, 2022. No space for raw animal manures in melon production. Melon E-news October 2022. • Singh SP, 2022. Melon food safety surveillance, monitoring and support. Melons News, July 2022. • Singh SP, 2021. Melon food safety surveillance, monitoring and support- VM20005, December 2021.

Project progress presentations delivered in SIAP meetings at mid-point and toward end of project.	As part of the project governance, four presentations were delivered, including two to the melon SIAP and one each to the PRG and Melons Australia Board of Directors.	<ul style="list-style-type: none"> The Safe Melons achievements (2021-2024) and what is in the next phase? Melon Fund- Strategic Industry Advisory Panel, Hort Innovation on 18 April 2024 (virtual) The Safe Melons project- past, present and future. Melons Australia Board Meeting, Brisbane 9 April 2024 VM20005- The project progress update (Aug 2021-March 2023). Melon Fund- Strategic Industry Advisory Panel, Hort Innovation on 18 April 2023 (virtual) VM20005- The project progress update. Project reference group (PRG) meeting held on 1 August 2022 (virtual)
Food safety helpdesk	All supply chain stakeholders were offered a food safety helpdesk service. Data on food safety helpdesk service enquiries to be delivered annually.	<p>It is estimated that ~204 enquiries via phone and email have been addressed throughout the project and could be categorised into following themes:</p> <ul style="list-style-type: none"> Microbiological testing results for QA schemes; wildlife incursions and management; organic soil amendments and its implications; selection of fertilisers, sanitisers and fungicides; postharvest wash water quality; environmental monitoring program; and postharvest packaging and decay. Response to extreme weather events (e.g. flooding and bushfires); primary production and processing (PPP) standards; food/health regulators enquiries on potential implications of melons in local illness clusters
International outreach (not listed in M&E)	International stakeholders were engaged through various meetings, highlighting the project outputs and outcomes.	<ul style="list-style-type: none"> Singh SP, 2024. Exploring food safety and traceability data-sharing opportunities in the horticultural export supply chains. Dubai Municipality (Food Safety Authority) on 19 June 2024 (virtual). Singh SP, 2023. NSW DPI's Fresh produce safety and traceability program and Safe Melons lessons. The US Food and Drug Administration and Crème Global on 14 December 2023 (virtual). Singh SP, 2023. NSW DPI's Fresh produce safety and traceability program and Safe Melons lessons. Western Growers Association, USA on 5 December 2023 (virtual) Singh SP, 2023. Australian fresh produce safety- highs and lows. Organised by the Swedish University of Agricultural Sciences, Alnarp, Sweden on 23 May 2023. Singh SP, 2022. Future trends in quality, safety and traceability of fresh horticulture produce. Organised by Brahma Singh Horticulture Science Foundation, Delhi, India on 23 October 2022 (virtual)

Outcomes

Table 3. Outcome summary

Outcome	Alignment to fund outcome, strategy and KPI	Description	Evidence
Melon Fund Outcome 2 The Australian melon industry has increased profitability, efficiency and sustainability through innovative research and development	Melon fund outcome 2: Strategy 4. Continue developments in risk management practices to support a food safety culture Melon Fund KPI:	The project captured 149 melon growers through the national monitoring and surveillance program to identify and manage food safety risks along the supply chain. The project	The industry has achieved 'zero food safety incidents and product recalls' for the six consecutive years, including the life of this project. The success of this project

<p>(R&D), sustainable best management practices (BMPs), pollination, food safety and biosecurity.</p> <p>Project outcomes Successful supply of safe melons to the consumers in domestic and export markets (zero product recalls and food safety incidents) Food safety risks to consumers and industry minimised through a preventative and proactive approach Key food safety indicators that have been tested for the melon industry, highlighting trends and any risks/opportunities</p> <p>Confidential communication of these indicators with growers and industry in general with the intent to improve food safety best management practices</p>	<p>A monitoring system in place that tracks a food safety culture</p> <p>Project KPI: Target number (at least 20) of melon growers and packers consulted about their food safety practices across all major melon production regions.</p> <p>At least 3,900 samples for microbiological analyses collected and survey reports prepared.</p> <p>One-on-one consultation and site visits continue to be the most effective strategy in grower engagement. 30 growers visits were proposed in this project along with 8 technical presentations through regional forums.</p>	<p>activities provided a comprehensive coverage of all scales of melon production in all melon producing regions through 153 sampling events, averaging one per week over the life of the project.</p> <p>A total of 4,799 samples (against the target of 3,900) were collected, analysed and reported to relevant growers and Hort Innovation. The aggregated and anonymised datasets were presented in the industry forum to showcase regional, state and national level performance of the industry against set targets.</p> <p>Forty-two site visits were conducted in this project along with 14 technical presentations delivered across Australia, engaging over 200 participants representing the melon supply chain including growers and packers.</p>	<p>was dependent on the grower/packer’s engagement on highly sensitive topic of microbial food safety. The level of engagement clearly indicates that stakeholders trust the monitoring and support services provided by an independent team of experts and were interested in risk mitigation.</p> <p>The ‘Safe Melons’ project was awarded the ‘Project of the Year Award 2022’ by the then NSW Department of Primary Industries.</p> <p>The peak industry body, Melons Australia, has been applauding the science- and data-based support through this project that enabled the industry in achieving food safety excellence.</p> <p>The confidentiality of project data and information was maintained as per contractual commitment.</p>
<p>Melon Fund Outcome 2 Improved capability and an innovative culture in the Australian melon industry maximises investments in productivity and demand.</p> <p>Project outcome Increase in grower practice change in food safety best management practices</p> <p>Increase in collaboration between growers and researchers to ensure RD&E levy investment outputs are relevant and accessible to end-users, and industry RD&E gaps/needs are reported to Hort Innovation.</p>	<p>Melon fund outcome 3: Strategy 1. Deliver communication and extension capability to create positive change</p> <p>Melon Fund KPI: Establishment of a baseline to develop relevant measurables and demonstrate increased share of industry with positive change in knowledge, attitudes, skills and aspirations (KASA), practice and impact in targeted high-priority areas (e.g., export capability, quality, soil health, food safety)</p> <p>Project KPI: Site visits to 30 melon</p>	<p>Melon growers and packers participated in this project and allowed the microbiological samples collection from their fields, harvest and postharvest operations.</p> <p>Technical recommendations reports were provided to growers and packers to improve their food safety practices and manage their risks.</p> <p>The microbial surveillance data was overlaid with corresponding industry practice information to develop a data-based decision making.</p> <p>A total of 42 site visits, 14 presentations and regional</p>	<p>Australian melon industry has become exemplary in science- and data-based food safety risk management approaches.</p> <p>The continuity of the Safe Melons program has contributed to a stronger food safety culture in the industry which has been documented in a technical article (Melons News June 2023).</p> <p>The enhanced food safety KASA in the melon industry is driving food safety indicators within the set targets. However, the extreme weather events such as flooding, heavy rainfall and bushfires have impacted growers’ ability to produce and supply safe</p>

	growers; 8 technical presentations through regional forums; and 6 technical articles delivered through melon industry' communication channels.	forums and 12 technical articles were delivered to the industry to enhance their food safety KASA and continue the adoption of best practice.	melons. This project developed and delivered technical resources to meet state agencies and industry needs in managing those risks.
--	--	---	---

Monitoring and evaluation

Table 4. Key Evaluation Questions

Key Evaluation Question	Project performance	Continuous improvement opportunities
<p>Effectiveness: To what extent has the project achieved its expected outcomes?</p> <p>Has the project team conducted melon food safety monitoring in the major melon production regions?</p> <p>Has the project team conducted microbiological surveillance by collecting and analysing at least 3,900 samples for target foodborne bacterial pathogens and mapped the food safety risks along the supply chain?</p> <p>Has the project team engaged with the melon growers and packers by providing them food safety monitoring reports and technical advice as and when needed?</p> <p>Has the project team provided the food safety helpdesk service and site visits to the melon growers and packers?</p> <p>Have all activities, KPIs and outputs been achieved?</p>	<p>Yes, the project team delivered melon food safety monitoring and support services in all major melon production regions outlined in the project activity 1 in the Results and Discussion section of this report.</p> <p>Yes, 4,799 samples were collected, analysed and reported. The sample number was 23% higher than the target (3,900) set in the project.</p> <p>Yes, the participating growers were provided with monitoring reports. In case of positive detections, the follow-up and traceback investigations were conducted.</p> <p>Yes, the project team has addressed approximately 200 enquiries from a diverse range of stakeholders including growers.</p> <p>All project activities have exceeded the set KPIs for this project.</p>	<p>Food safety requires continuous improvement to develop and nurture a strong food safety culture. The melon production and processing businesses have a reasonably high turnover of QA staff, leading to seasonal follow-up requirements to ensure their best practice procedures were handed over by their predecessors. There is still an opportunity to develop an online system of engaging all growers and packers to provide the 'Safe melons' team an alert if there were any changes in the people and practices. A real-time collaboration mechanism at the industry as a whole using digital tools would be an area for improvement.</p>
<p>Relevance: How relevant was the project to the needs of intended beneficiaries?</p> <p>Did target beneficiaries participate in the project and had access to technical information and advice as proposed?</p> <p>To what extent has the project met the needs of Australian melon industry?</p> <p>Are there any gaps or additional</p>	<p>Food safety is the most important pillar of the melon industry' growth and profitability, hence the project was highly relevant. This project boasts high levels of grower engagement (149). The surveillance strategy captures almost all commercial growers at various stages of sampling. The technical information and advice were provided through communication and engagement strategy on ongoing and emerging challenges such as PPP standards.</p> <p>This project has been exceeding the expectations of the industry in terms of service quality and response time. The project team has responded to unusual circumstances such as extreme weather events and wildlife incursion issues.</p> <p>The additional research gaps and</p>	<p>The project addresses ongoing, contemporary and emerging challenges from both microbial risks and regulatory mechanisms. However, there is a need to expand the surveillance program to capture "unusual" suspects which could potentially cause harm to the industry. The use of whole-genome sequencing (WGS) is highly recommended to provide deeper insights into the sources and routes of microbial contamination and to effectively liaise with food/health regulators.</p>

<p>opportunities for research?</p>	<p>opportunities have been highlighted in the next section.</p>	
<p>Process appropriateness: How well have intended beneficiaries been engaged in the project?</p> <p>Has the project team engaged with proposed number of melon growers/packers and other stakeholders?</p> <p>Has the project team communicated the food safety best practice to the end-users?</p> <p>Did the project engage with industry levy payers through appropriate methods?</p> <p>How appropriate were the project activities and outputs for achieving its intended outcomes?</p> <p>How appropriate were the management and governance processes and the resources used for delivering the project?</p>	<p>The intended beneficiaries (growers, packers, exporters, retailers, and regulators) were very well engaged in this project as shown by data on surveillance and participation in various stakeholder events and meetings.</p> <p>Yes, the project team exceeded the targets of engagement through site visits, regional workshops, conferences and targeted meetings.</p> <p>Yes, technical articles emphasising continuity of best practice adoption and information relevant to emerging issues were disseminated through communication channels.</p> <p>Yes, engagement with levy payers was mainly through face-to-face meetings and site visits. The levy payers appreciated the service delivered to their remote farms.</p> <p>The intended outcomes were achieved as shown by project KPIs and overall industry’s food safety success indicators.</p> <p>The project governance was managed through a PRG meeting and then subsequent presentations to the Melon SIAP.</p>	<p>The ‘Safe Melons’ program is an epitome of grower engagement. However, there is further scope for strengthening the engagement through additional measures. As the industry’ maturity level in handling food safety issues has significantly improved in recent years, there is an opportunity to identify “champions of change” and make positive stories on their food safety adoption journeys. More engagement on contentious issues regarding sustainability and wildlife impacts on food safety are required in the near future.</p>
<p>Efficiency: What efforts did the project make to improve efficiency?</p> <p>Did the project identify opportunities to improve efficiencies? (including implementation of new technology, technique, practices, workflow etc.)</p>	<p>Several efforts were made to increase the delivery efficiency such as combining site visits with regional workshops and leveraging other projects delivery in the same region. In the laboratory, the new technology (MALDI-TOF) was acquired to reduce the cost of pathogen detection and increase throughput. As a result of these efficiency measures, the project could deliver 25-50% more outputs within the budget and timeline. The modified pathogen detection assays and automation of laboratory workflows have contributed tremendously to enhanced efficiency.</p>	<p>The project efficiency can be further enhanced through the use of WGS in real time, slightly reducing the demand for additional analyses during follow up and traceback investigations. Further automation of laboratory techniques could reduce the cost and reduce the turnaround time for reporting back to melon growers and packers.</p> <p>To reduce the reliance on levy funds, an alternative model for ‘Safe Melons’ need to be developed and proposed in the future.</p>

Recommendations

Zero product recalls and food safety incidents are perceived as an ambitious and unrealistic goal, but it is the minimum goal that all industries should be aiming for. Since 2018, the melon industry has been achieving this for straight six years. To continue the current food safety performance track record, following recommendations are made:

- Adopt or continue to adopt a quality assurance food safety scheme (e.g., Freshcare, SQF, Global GAP) which should be benchmarked against the Global Food Safety Initiative (GFSI). The scope of the scheme should include primary production and processing for growers and packers.
- Adopt or continue to adopt melon food safety best practice guidelines provided by the NSW Department of Primary Industries and Regional Development and Hort Innovation. These resources are available at the websites of the [department](#) and [Melons Australia](#).
- Avoid the use of raw or untreated animal manures and biosolids in melon production fields due to the high risk of unsafe animal products outweighing the benefits for soil health and plant nutrition.
- The use of plastic mulch (where possible) minimises the risk of environmental pathogen transfer from soil to the fruit surface.
- Irrigation and chemical spray water should be microbiologically safe. Regularly review the water sources and their potential contamination, especially for surface water sources (rivers and dams).
- Periodically review and manage wildlife-associated food safety risks. Educate farm workers to report affected areas and crops. Natural disasters (e.g. bushfires, flooding) can displace wildlife towards the production fields.
- Extreme weather events (e.g. dust storms, heavy rainfall, cyclones and bushfires) can aggravate the transfer of environmental pathogens into water sources, production fields and on to melon fruits. Review food safety management plans in response to these events and factor these events as 'highly likely' in farm risk assessments.
- Clean and sanitise harvesting machinery and packhouse premises after each shift, focusing on fruit contact surfaces such as conveyor belts and brushes.
- Pre-cool melons (especially rockmelons and honeydew) before washing and sanitisation. Use drinking-quality wash water with no recirculation (run-it-to-waste) along with the recommended concentration of sanitisers and contact time.
- Continue participation in the food safety surveillance and monitoring program to seek independent technical advice on risk mitigation.

Future R&D recommendations:

The disruption of foodborne illness outbreak cycles has contributed to the industry's improved reputation and positioning in domestic and export markets. Surveillance and monitoring of melon food safety have proven highly effective in verifying preventive controls and promptly managing potential failures in the supply chains. However, from February 2025, food safety within the melon industry will be subject to regulation under the Primary Production and Processing (PPP) Standards (4.2.9). These standards will be applicable to all melon growers, regardless of the scale of their operations. Effective and consistent communication, collaboration, and targeted support are key elements in achieving a successful transition into the regulatory phase.

The recommendations for the future R&D are as follows:

- Continue melon food safety surveillance and monitoring program to identify food safety vulnerabilities along the farm-to-fork pathway and address them rapidly and effectively.
- Apply whole-genome sequencing in surveillance to put the industry at the forefront of combining a strong food safety culture with world-leading science, data and technology.
- Provide technical and compliance resources, support and guidance for growers to enable compliance with the new PPP standards as per their jurisdiction's requirements.
- Continue offering a food safety helpdesk service for technical enquiries and a credible source of information for risk mitigation.

- Strengthen outreach and networks through site visits, industry forums and conferences by disseminating key findings and project outputs.
- Develop and propose a new model for the future continuity of the 'Safe Melons' program that reduces the reliance on melon R&D levy funds.

Refereed scientific publications

Journal article

- Singh SP, 2023. Flooding adversely impacts fresh produce safety. *Microbiology Australia* 44(4), 185–189. doi:10.1071/MA23054.

Refereed technical articles

1. Singh SP, 2023a. Microbial food safety risks associated with producing and processing fresh produce in bushfire-affected regions December 2023, Primefact PUB23/1247, first edition. <https://www.dpi.nsw.gov.au/agriculture/horticulture/food-safety>
2. Singh SP, 2023b. Managing floodwater associated food safety risks in melon production and postharvest handling December 2023, Primefact PUB23/1340, first edition. <https://www.dpi.nsw.gov.au/agriculture/horticulture/food-safety>

References

- Australian Horticulture Statistics Handbook 2022/23, 2024. Horticulture Innovation Australia Limited <https://www.horticulture.com.au/contentassets/3f91006fdf6940fab7d4753987e871af/ort-stats-intro-22-23.pdf> (accessed on 10 June 2024)
- Chan Y, Hoban, A, Moore H, Greig DR, Painset A, Jorgensen F, Chattaway MA, Jenkins C, Balasegaram S, McCormick J, Larkin L, 2023. Two outbreaks of foodborne gastrointestinal infection linked to consumption of imported melons, United Kingdom, March to August 2021. *Journal of Food Protection*, 86 (1):100027.
- European Food Safety Authority (EFSA), 2021. Multi-country outbreak of Salmonella Braenderup ST22, presumed to be linked to imported melons - 20 July 2021. Stockholm: ECDC/EFSA; 2021. <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/sp.efsa.2021.EN-6807> (accessed on 10 June 2024)
- Food Standards Australia New Zealand (FSANZ), 2024. FSANZ Consumer Insights Tracker 2023: Technical Report. Canberra, Australia and Wellington, New Zealand. <https://www.foodstandards.gov.au/sites/default/files/2024-05/Consumer%20Insights%20Tracker%202023%20Technical%20Report.pdf> (accessed on 10 June 2024)
- US Food and Drug Administration, 2024. Outbreak investigation of Salmonella: cantaloupes (November 2023). <https://www.fda.gov/food/outbreaks-foodborne-illness/outbreak-investigation-salmonella-cantaloupes-november-2023> (accessed on 10 June 2024)

Intellectual property

No project IP or commercialisation to report.