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United Fresh
Technical Advisory Group

Introduction

United Fresh Technical Advisory group recently attended a webinar on Irradiation technology. This technology has been controversial over the years. The purpose of this summary is to look at the current activities and regulatory approach.

Food Irradiation – Understanding an Underutilized Technology

This webinar was hosted by the Australian Institute of Food Science and Technology (AIFST), with five presentations on the topic of "Food Irradiation – an underutilised technology". The speakers for the five presentations covered in the webinar were:

- **Nick McLeod,** Director of Tropical Fruit and Market Access, from the Department of Agriculture and Fisheries of Queensland – Horticulture Research & Development.
- **Peter Leach**, Market Access Team Leader, for Department of Agriculture and Fisheries of Queensland – Phytosanitary Irradiation, an Australian perspective.
- **Luisa Trevisan** from the Standards and Surveillance Section at Food Standards Australia New Zealand (FSANZ) – FSANZ's assessment of fruit and vegetables treated with ionising radiation.
- **Peter Roberts** from Radiation Advisory Services – Irradiation of Food – Versatile, Effective, under-utilised.
- **Ben Reilly** from Steritech Fresh Produce – Creating commercial solutions: research, regulation, and infrastructure.

Horticulture Research & Development

The presentation given by Nick McLeod was geared towards providing a snapshot of current Horticulture research in Queensland.

The information for the snapshot was provided by the Queensland Department of Agriculture and Fisheries.

The potential use of irradiation for sanitary and phytosanitary purposes has been known since 1920, and commercialised for international irradiated fruit exports, starting in 2004 between Australia and New Zealand.

Queensland now approves the use of irradiation for phytosanitary purposes domestically, and for international exports. Irradiation is an alternative to chemical treatments, but it is not yet perfect.

The quality of the fruit prior to being subjected to the treatment is critical. example, "If fruit quality is poor before treatment, it will only get worse after treatment and long transport periods."

Phytosanitary Irradiation – An Australian Perspective

The presentation given by Peter Leach, expands upon the previous presentation regarding the applications irradiation has for phytosanitary purposes.

The aim of the work conducted by the Queensland Department of Agriculture and Fisheries was to provide industries with multiple treatment options, so exporters can choose between chemicals vs non-chemical treatments, and sea freight vs airfreight.

Irradiation for sanitary and phytosanitary purposes has been investigated since the early 1900s, but currently it is generating vigorous debate regarding the impact on food safety.

There has been extensive research conducted over the years on food irradiation, and it is endorsed by many international organisations, more so than other technologies.

Australia has facilities that employ irradiation technologies for sanitary and phytosanitary purposes. These facilities may employ one or more of the following types of radiation:

- **Gamma radiation**, which has good penetration of items, but has a slow processing rate (suited for small to medium pallets).
- **Electron beam** (E-beam) radiation, which has low penetration of items, but a fast-processing rate (better suited for small packages).
- **X-ray radiation**, which has very good penetration of items, with an intermediate processing rate (suited for larger pallets).

The processing rate of each type of radiation is dependent on the time it takes for a product to absorb a certain dose of radiation. Codex has a set of General Standards for irradiation, stating that the overall irradiation dose for food to be considered "safe and wholesome" is 10 kGy (kiloGrey).

More crops are able to tolerate irradiation than any other phytosanitary treatment (e.g., heat, cold, or fumigation treatments. However, while irradiation is able to treat a larger spectrum of crops, within each crop, certain varieties will be more prone to damage from irradiation treatment. For example, some mango varieties tolerate irradiation without problem, while other varieties cannot be irradiated without being damaged. The only crop exception is strawberries, which have a very high tolerance to being irradiated, independent of variety.

There has been significant work done towards establishing irradiation based International Standards for Phytosanitary Measures (ISPM), with the negotiations for the new protocols and standards usually taking 10 years to be finalised.

These standards mainly deal with the insect pests rather than the legislation in the country about food safety. Unless a country approves the standards for irradiation, they cannot be used. There is also no legally binding international legislation on the safety of phytosanitary irradiation.

There are several broad categories for the legislation of food irradiation:

- Countries that reject irradiation of food.
- Countries that approve irradiation for, at least, one commodity (Australia 2003-2021).
- Countries that have generic (or class wise) approval for groups of food (Australia from 2021).
- Countries that use irradiation domestically, but do not allow it for imports (Japan).

Multiple options, for multiple commodities & multiple markets are being developed. It is believed that there is a huge potential for irradiation in helping Australian industries.

FSANZ's assessment of fruit and vegetables treated with ionising radiation

This presentation covers the role Food Safety Australia & New Zealand (FSANZ) has in the food irradiation space, and the process used by FSANZ to assess applications for development of standards on the irradiation of fruit and vegetables.

FSANZ's involvement is in the development and administration of the Australia New Zealand Food Standards Code, a legislative instrument that is given effect by Australian & New Zealand legislation, FSANZ is not responsible for enforcement. That role is the responsibility of the state and/or country.

The application pathway follows a statutory process with multiple steps and set timeframes, such as:

- Pre-application assistance.
- Assessment – where risk assessment and risk management are undertaken.
- Consultation.
- Board review and decision
- Communication of board decision to the relevant government partners and ministers.

A recent application (A1193), submitted in November 2019, sought permission to irradiate all types of fresh fruit and vegetables. The applicant wanted to expand the existing code from 26 fruit and vegetables to all fruit and vegetables, with dried pulses, legumes, nuts, and seeds not in the scope of the change.

The assessment of the A1193 application comprised of the assessment of four main elements:

- A **technical assessment**, where the team considered whether irradiation achieves its stated purpose.
- A **safety assessment**, where the team questions whether there are any public health and safety concerns associated with eating fresh fruit and vegetables that have been irradiated at doses of up to 1 kGy (KiloGrey), which refers to the amount of energy absorbed by the target material.
- A **nutritional assessment**, where the team aims to understand the effect of irradiation on the nutrient content of fruit and vegetables.
- An **intake assessment**, where the team questions the impact of eating irradiated produce on population nutrient intakes.

During the assessment, it was noted that there was a lack of acceptance of the technology by some consumers, with this resistance not unique to Australia or New Zealand. The resistance by consumers, noted during assessment of the A1193

application, could have been related to misunderstandings and misinformation surrounding the actual process and its effects on food. Another reason for the consumer resistance may have been the fact that the application represented a "blanket" approval covering, all fruit and vegetables.

Despite the resistance faced during the consultation period, the A1193 application was approved by FSANZ Board in May 2021 and Gazetted in July 2021. This means that, for example, it can now be applied in the event of a foreign or exotic pest incursion, which would otherwise place the Australian horticultural industry at risk.

Footnote: It is understood that a recent public consultation regarding irradiation, resulted in the largest number of individual submissions received for almost any topic.

Irradiation of Food: Versatile, Effective, Under-utilized

The presentation, given by Peter Roberts, focused on providing an overview of some of the other uses, besides phytosanitary treatment, and why irradiation is so underutilised.

The presentation emphasised that irradiation is a very versatile technology, providing benefits to food safety (e.g., decontamination), food security (e.g., extending storage times), and trade (e.g., quarantine treatments).

Irradiation technology has also proved effective in other areas besides food safety. For example, irradiation has been used to sterilise medical equipment, such as catheters and wound dressings, since the 1960s, as it requires no chemicals or heat, and it penetrates the packaging, which reduces the risk of recontamination.

Despite the potential benefits this technology can provide, it is greatly underutilised. The volume of food products treated with this technology globally are minuscule (less than 0.5 million tonnes annually) when compared to the volume of food treated with other methods.

One reason for the poor market uptake of irradiation technology is a result of retailer resistance to irradiated products appearing on their shelves. The resistance from retailers is mostly due to the requirements for labelling and the perception of consumer backlash.

there are three areas where there is growth potential for the technology:

- Storage and shelf-life extension.
- Food safety through the decontamination of pathogens.
- Quarantine treatments of export produce.

There are multiple benefits to irradiation technology, as it is highly effective, but seldom used. There is also a need for better dialogue with retailers, wholesalers, and other supply chain participants. The use of the technology for phytosanitary treatment of export produce is highly promising, with at least 13 countries involved in trade in irradiated fresh produce. It is a promising technology, but work is still needed for its acceptance.

Creating commercial solutions: research, regulation, and infrastructure

The presentation, given by Ben Reilly, focuses on highlighting irradiation commercial solutions that already exist or are in development.

Steritech is the only commercial irradiation service provider in Australia, who optimises the treatment for the product and purpose. The company deals with a multitude of products ranging from medical equipment to imported goods, such as fresh produce with X-rays and electron beam (E-beams) being the only types of radiation used during the irradiation treatments.

The applications of irradiation technology may have a future in:

- Better servicing unique market segments, such as food for high-risk consumers and/or high-risk products.
- An alternative to other less desirable phytosanitary solutions.
- Extending product shelf-life, which allows for extended distribution and better management of supply chain disruptions.

Some learnings Steritech gained from working with irradiation technology and with the supply chain were:

- There is a need to identify demand and opportunity for these services.
- There is a need to develop market specific food standards.
- There is a need for specialised staff, with supporting systems and procedures.

Closing Comments

The five presentations, given during the webinar, had a common underlying theme - irradiation has significant potential for sanitary and phytosanitary purposes, despite the negative perceptions consumers have. These concerns stem from the term "radiation", which is, under normal circumstances, perceived as something harmful. Work is underway, in terms of determining the full impact irradiation treatments have in fresh produce quality, shelf-life and pest management. In addition to research, consumers need to be educated on what irradiation is, what happens to the treated materials and what are the implications in terms of health and safety.

Irradiation technology has the potential to be the new "go to" phytosanitary treatment to eradicate pathogens that may present in food if regulators accept its use. There is still room for improvement and challenges to overcome with the technology being another step towards a more sustainable future.