QUESTIONS AND ANSWERS ABOUT IRRADIATION OF FRUIT AND VEGETABLES

WHAT IS FOOD IRRADIATION?

It's a way of processing food, for example to extend shelf life, and it is also widely used to ensure any biosecurity pests associated with the produce cannot establish in New Zealand – e.g. insects such as fruit fly.

The food is exposed to ionising radiation, either from gamma rays or a high-energy electron beam or x-rays. Gamma rays and x-rays are a form of radiation, similar to that in microwaves, but with much higher energy and penetration. The rays pass through the food just like microwaves in a microwave oven, but the food does not heat up to any significant extent. Electron beams and x-rays are produced using electricity, which can be switched on or off, and they do not require radioactive material.

HOW DOES THIS HELP IN BIOSECURITY?

Irradiation disrupts the development of any insects that may be concealed within produce. This means that any eggs or larvae present either do not develop into adults, or if adults do emerge or were present at the time of treatment, they are sterile and unable to produce viable offspring.

Irradiation is not specifically used to kill insects, but rather to disrupt their reproduction. Therefore live insects (e.g. fruit fly larvae) may be found on or inside fruit or vegetables that have been successfully treated.

Irradiation is recognised internationally as an effective means of providing quarantine security. Its use was was formalised by the International Plant Protection Convention (IPPC) in 2003, in the International standard for phytosanitary measures (ISPM) 18: Guidelines for the use of irradiation as a phytosanitary measure. Irradiation is not a new technology to New Zealand or the world. It is accepted by New Zealand to target fruit flies and other insects in tropical fruits such as mango.

HOW MUCH IRRADIATION IS USED?

The level of irradiation used to achieve control of insect development is low (150-250 Gy) compared with irradiation used for other purposes. For example, the level of irradiation used to increase the shelf-life of fruit or vegetables (e.g. kill food spoilage bacteria and fungi) is generally between 1000 and 10 000 Gy. These levels may be compared to the levels used to sterilise or kill all organisms on plastic items used in medicine typically 15 000–25 000 Gy.

Irradiation cannot make fresh produce radioactive.

WHAT FOODS ARE IRRADIATED?

Food Standards Australia-New Zealand (FSANZ) has approved irradiation for use on only a small number of fruits and vegetables – bread fruit, capsicum, carambola (star fruit), custard apple, litchi (lychee), longan, mango, mangosteen, papaya (paw paw), persimmon, rambutan and tomato.

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FSANZ is currently assessing Application A1092 seeking permission to irradiate an additional twelve specific fruits and vegetables – apple, apricot, cherry, nectarine, peach, plum, honeydew, rockmelon, scallopini, strawberry, table grape and zucchini (courgette).

HOW ARE FOODS PERMITTED TO BE IRRADIATED?

FSANZ must give permission before a food can be irradiated. FSANZ assessments consider:

- the technological need for the treatment;
- the safety of the treatment;
- effects on food composition; and
- effects on the nutritional quality of the food.

FSANZ does not allow irradiation to be used to clean up food that is unsafe or unsuitable for human consumption.

IS IRRADIATED FOOD RADIOACTIVE?

No. During irradiation, the food never comes into contact with the radioactive source and there are upper limits in place on the energy levels that may be used for treatment of foods. Therefore, the radioactive sources permitted do not generate gamma, electrons or x-rays of sufficiently high energy to make food radioactive. No radioactive energy remains in the food after treatment.

IS FOOD QUALITY RETAINED?

If the dose given is too high there can be off-flavours and tastes or softening of the food. But the quality of most foods is retained well and over-irradiation is not in the interest of either the radiation company or their food industry clients. Some foods are known to be poor candidates for irradiation, such as avocado, oily fish and some dairy products because of their high unsaturated fat content.

CAN I TELL IF FOOD HAS BEEN IRRADIATED?

The ANZ Food Standards Code standard stipulates that irradiated foods must be clearly labelled. Labelling ensures the consumer's right to know and to choose.

ARE THERE OTHER WAYS OF MANAGING PESTS IN FRUITS AND VEGETABLES?

Plant insect pests are usually managed through the in-field application of chemicals (insecticides) or by exclusion (e.g. bagging fruit, pest free areas) during production. However not all pests are managed to an acceptable level during production and for some important pests, treating the fruit or vegetables after harvest is required to address any remaining risk.

Post-harvest treatments fall in to five main categories: temperature, physical, modified atmospheres, chemical and irradiation treatments. In each case the selection of the best treatment depends on its effectiveness against the target pests, logistics, availability of the treatment, and in particular, the impacts of the treatment on the product.

Temperature: Applying heat or cold temperatures targets specific pests and results in mortality. While all pests will be killed by extreme temperatures, fruit and vegetables can only tolerate relatively mild temperature extremes. The maintenance of a specified temperature for a defined period that is commercially tolerable for fruit or vegetables can be very effective for certain but not all pests. Sometimes the rate of increase (or decrease) in the temperature is also important. In general, heat treatments work over minutes or hours while cold treatments work over periods of days or weeks.

Physical: The application of physical methods (eg brushing or washing) is often very effective in removing surface pests although this may not result directly in mortality. The effectiveness depends on the nature of the fruit, eg pests on smooth skinned fruits are more likely to be removed than those on rough or hairy skinned fruits. Soft fruit can be easily damaged and not tolerate physical treatment.

Modified atmospheres: Changing storage atmospheres through the removal of oxygen or addition of nitrogen and/or carbon dioxide can be successfully used to kill a number of pests over days or weeks.

Chemical: The application of chemicals to fruit or vegetables post-harvest is done through a variety of methods including fumigation (application of gaseous insecticides in a closed environment), 'flood spraying', and dipping in solution, to achieve mortality. Some insects can take several days or even weeks to die following chemical treatments.

Irradiation: As above, irradiation causes changes and disruption to the DNA of a pest organism, preventing the establishment of viable pest populations in New Zealand.