potatoes, onions and wheat

Within the last 17 years ionizing radiation has come into use, at first experimentally, as a means of food preservation — an innovation which has been described as the only novel food process since the invention of canning about 150 years ago. Research into the feasibility of preserving a wide variety of food products by this method is now being carried out in more than 50 countries, and irradiated potatoes, onions and wheat are among those which have been cleared for human consumption by some national public health authorities.

Organizations in 19 countries are taking part in and financially supporting an international project concerned mainly with the wholesomeness testing of selected food products treated by irradiation. This project, established formally on 1 January this year, has been launched by the

European Nuclear Energy Agency of the Organization for Economic Co-operation and Development (ENEA) and the IAEA together with FAO; WHO is participating in an advisory capacity. Tests are to be carried out under contract in specialized laboratories in member countries of the OECD, IAEA or FAO as part of an overall programme co-ordinated by a small central body and under the direction of a project leader at Karlsruhe, in the Federal Republic of Germany.

First priority is to be given to the testing of irradiated potatoes, wheat and wheat products for wholesomeness with the aim of obtaining unconditional acceptance of these products, for which a temporary acceptance for five years was recommended by a joint FAO/IAEA/WHO expert committee in 1969. The report of this committee has been published by the World Health Organization in its Technical Report series (No.451: Wholesomeness of irradiated food, with special reference to Wheat, Potatoes and Onions) and may be purchased through WHO distribution and sales agents.

Food products may be irradiated for differing purposes. The power of radiation can be directed against bacteria, yeasts, moulds and insects that spoil food intended for humans, against sprouting in vegetables such as potatoes, and against bacteria and other pathogenic organisms that are dangerous for human health. Wholesomeness testing is concerned with feeding trials and supplementary tests to remove, as far as possible, any element of doubt that processing of food in this manner has any appreciable effect on food quality or on human health in either the short- or the long-term. Systematic animal feeding trials are spread usually over a two-year period.

The use of relatively low doses of radiation to wipe out insects in a product such as stored food grain is known simply as disinfestation; use to destroy animal parasites in meat products, or microorganisms capable of causing food poisoning or spreading infectious disease is known as radicidation. The partial destruction of microbes — pasteurization by radiation, or radurization — slows down spoilage and prolongs storage life for some time. The total destruction of bacteria, yeasts and moulds, combined sometimes with mild heat treatment to inactivate enzymes, and with packaging to prevent re-infection with microbes, can stabilize a food product permanently; this is known as radappertization (borrowing from the name of the inventor of food canning, Nicholas Appert). This technique requires the use of large doses of radiation.

Relatively low doses of radiation may also be used to arrest or slow down the natural processes of fruit ripening and vegetable sprouting. This was the first application of the radiation processing of a food product to be approved by a national authority — in the USSR, in 1958, for the inhibition of sprouting in potatoes.

In July last year the joint FAO/IAEA Division of Atomic Energy in Food and Agriculture published a Training Manual on Food Irradiation Technology and Techniques (No.114 in the IAEA Technical Reports Series), for use in training courses and by research scientists interested in this work. Two training courses, organized by the IAEA and FAO in co-operation with the United States Atomic Energy Commission, were held in 1967 and 1969.

The approvals shown in the chart reproduced here are those of which the joint Division had been informed officially before the end of 1970.

Ionizing radiation may be used to inhibit sprouting of potatoes. Here, potatoes of the Katahdin variety, exposed to varying radiation doses and stored for 5,5 months at 55°F (~ 13°C). Photo: Research Branch, Canadian Department of Agriculture

GENERAL SURVEY OF IRRADIATED FOOD PRODUCTS CLEARED FOR HUMAN CONSUMPTION IN DIFFERENT COUNTRIES

Country	Product	Purpose of Irradiation	Radiation Source	Dose, in kilorads (permissible range)	Date of approval
CANADA	potatoes	sprout inhibition	Cobalt 60	10 max. 15 max.	9 Nov. 1960 14 June 1963
	onions	sprout inhibition	Cobalt 60	15 max.	25 Mar. 1965
	wheat and wheat products	insect disinfestation	Cobalt 60	75 max.	28 Feb. 1969
ISRAEL	potatoes	sprout inhibition	Cobalt 60	15 max.	5 July 1967
	onions	sprout inhibition	Cobalt 60	10 max.	25 July 1968
NETHERLANDS	asparagus (experimental batches)	radurization	Cobalt 60	200 max.	7 May 1969
	cacaobeans (experimental batches)	insect disinfestation	Cobalt 60 4 MeV Electrons	70 max.	7 May 1969
	strawberries (experimental batches)	radurization	Cobalt 60 4 MeV Electrons	250 max.	7 May 1969
	mushrooms	radurization	Cobalt 60 4 MeV Electrons	250 max.	23 Oct. 1969
	potatoes	sprout inhibition	Cobalt 60 4 MeV Electrons	15 max.	23 Mar. 1970
SPAIN	potatoes	sprout inhibition	Cobalt 60	5—15	4 Nov. 1969
USA	wheat and wheat products	insect disinfestation	Cobalt 60 Cesium 137 5 MeV Electrons	20—50 20—50 20—50	21 Aug. 1963 2 Oct. 1964 26 Feb. 1966
	white potatoes	sprout inhibition	Cobalt 60 Cesium 137 Cobalt 60 and Cesium 137	5—10 5—10 5—15	30 June 1964 2 Oct. 1964 1 Nov. 1965

Country	Product	Purpose of Irradiation	Radiation Source	Dose, in kilorads (permissible range)	Date of approval
USSR	potatoes	sprout inhibition	Cobalt 60	10	14 Mar. 1958
	grain	insect disinfestation	Cobalt 60	30	1959
	dried fruits	insect disinfestation	Cobalt 60	100	15 Feb. 1966
	dry food concentrates	insect disinfestation	Cobalt 60	70	6 June 1966
	fresh fruits and vegetables (experimental batches)	radurization (extension of market life)	Cobalt 60	200—400	11 July 1964
	semi-prepared raw beef, pork and rabbit products, in plastic bags (experimental batches)	radurization	Cobalt 60	600—800	11 July 1964
	poultry eviscerated, in plastic bags (experimental batches)	radurization	Cobalt 60	600	4 July 1966
	culinary prepared meat products (fried meat, entrecôte), in plastic bags (experimental batches)	radurization	Cobalt 60	800	1 Feb. 1967
	onions (experimental batches)	sprout inhibition	Cobalt 60	6	25 Feb. 1967