

CONSUMER AND FOOD INDUSTRIES EDUCATION ON FOOD IRRADIATION

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Abstract. A survey was conducted on Malaysian food industries to determine the interest and potential applications of food irradiation as an alternative or to complement existing food preservation treatments. A total of 37 food processors representing 5 subsectors of the food industry participated in the survey. Information collected showed that majority of respondents were aware of food irradiation but the level of knowledge was low. Half of respondents perceived food irradiation as safe and 23% will consider using it for commercial purposes. Main concerns of the food processors were safety of the process, safety of irradiated food, efficacy of the process and consumer acceptance. Food irradiation applications considered to have the most potential for use by the food industry, were those which would improve the hygienic quality of food products. Despite the limited knowledge, respondents strongly supported the need to promote food irradiation technology in Malaysia. In view of this finding, various promotional activities have been continuously carried out to increase public awareness and understanding of the technology so as to facilitate acceptance of food irradiation in Malaysia.

1. INTRODUCTION

Although Malaysia is fast becoming an industrialized nation, its agricultural sector continues to play an important role in the overall economic development of the country. Based on past trends in food production and consumption, Malaysia will continue to import its requirements for foodstuffs such as rice and dairy produce though the country is self sufficient or even able to export commodities such as poultry, fruits and vegetables. Currently, Malaysia is the major exporter of palm oil and ranks third in pepper and fourth in cocoa beans in terms of its contribution to world trade [1].

The food processing industry is one of the major contributors to manufacturing development in Malaysia with average growth of over 10% annually between 1984 to 1995 and an output value of RM 9.9 billion in 1995 [2]. The main sub-sectors within this industry are processed meat, fruits and vegetables, fish products, dairy products, cereal-based products; sugar and confectionary; edible oils and fats; (coffee, cocoa, tea and spices); beverages (non-alcohol); prepared animal feeds and miscellaneous food products. With increasing affluence, changing lifestyles and bigger population base, the industry is expected to record another phase of growth. As it gears for expansion, the industry is faced with a host of technical issues and challenges which include understanding food trends, compliance to legal requirements, choice of technology, acceptable levels of chemical contaminants/pesticide residues and emergence of new pathogens such as *Listeria* and certain strains of *E. coli*. To meet these challenges, food irradiation is being considered as an alternative or/and complementary technology for the food industry.

In Malaysia, a research and development programme on food irradiation was established in 1982 with the final aim of transferring the technology to the food industries. A National Working Committee on Food Irradiation was also formed to coordinate activities pertaining to R&D applications, adoption and technology transfer of food irradiation. To date, technical feasibility studies on several food items of economic importance were successfully undertaken (Table I). Economic feasibility studies on a multipurpose Co-60 facility indicated that with sufficient throughput of less than 18,000 MT/annum, the unit cost of irradiating local products are cheaper compared to that in developed countries [3]. Malaysia's infrastructure for promoting radiation technology was enhanced with the installation of a demonstration Co-60 irradiator 'Sinagama' (present activity 0.95MCi) at MINT in 1989 followed by the commissioning of a 3MeV electron beam machine 'Alurtron' in 1991.

Presently, Sinagama provides irradiation services mainly for medical products and pharmaceuticals. This facility is also being used for demonstrating economic feasibility and semi-commercial trials of food irradiation.

TABLE I. POTENTIAL AGRICULTURAL COMMODITIES/FOOD FOR IRRADIATION

Types of food	Purpose of irradiation	Max. dose (kgy)
Milled rice	Control insect infestation	1
Black and White Pepper	Control insect infestation	1
Reduce microbial load		10
Frozen shrimp	Eliminate pathogenic Microorganisms	5
Chilled chicken microorganisms	Eliminate pathogenic	3
Fresh ginger	Inhibit sprouting during storage	0.05
Cocoa beans	Control insect infestation	1
Control fungi infection		6
Fresh fruits (papaya, starfruit)	Control insect infestation (quarantine)	<0.5
Cut flowers	Control insect infestation	<0.5

For food irradiation to reach its full potential benefit, it must gain acceptance from all sectors i.e. the government, the food industry and consumers. In Malaysia, the commercial application of the technology suffers delay, possibly due to a number of economic and technical issues facing the food industry and national regulatory control authorities as well as the attitude of the public to the irradiation of food. Recent global trade developments, in particular adoption of the Agreement on the Application of Sanitary and Phytosanitary Measures (GATT Uruguay Round) and the prohibitions/restrictions of a number of food fumigants such as ethylene oxide and methyl bromide are likely to increase trade in irradiated food [4]. In view of these developments, Malaysia realized the need to promote food irradiation. A comprehensive education programme has been developed by the National Working Committee on Food Irradiation in 1995 with IAEA assistance [5]. Based on the experiences of other countries, the approach of the programme will be to examine consumer and food industry attitudes towards this technology, develop and measure impact of education materials on their attitude, then pilot test the education materials with actual irradiated food products in the market place. Under this CRP, the following activities were identified and conducted with the specific objectives:

1. Evaluation of food industry attitude to food irradiation: to determine food industry awareness and interest to utilize irradiation technology.
2. Development of consumer education materials: to produce materials which address consumer concerns and highlighting the benefits of the technology.
3. Promotion of food irradiation: to increase fact-based information on food irradiation seen by general public.

2. EVALUATION OF FOOD INDUSTRY ATTITUDE

A survey was conducted on local food processors to evaluate current awareness/knowledge on food irradiation, to identify interest and to determine potential application by the food industry.

2.1. Methodology

The survey involved development of questionnaire, selection of food processors as respondents, data collection and data analysis. Food processors were selected based on food products/agriculture commodities, which have the potential to be irradiated. In Malaysia, these include spices, frozen seafood, fruits, cocoa products, poultry, cereal and food packaging materials. These food products made up five of the ten subsectors in the Malaysian food processing industry. A total of 107 food processors was selected and approached as respondents for this study.

2.2. Results and discussion

A total of 37 food processors participated in the survey. Although participation rate was relatively low, each sub-sector was represented as shown in Table II.

TABLE II. PROFILE OF RESPONDENTS (N = 37)

Sub-sector	Respondents	
	Frequency	Percentage
Cereal-based products	6	16
Coffee, cocoa, tea and spices	6	16
Processed meat	9	24
Fish products	7	19
Processed fruit and vegetables	3	8
Miscellaneous food products	6	16

The study indicated that 78% of respondents were aware of food irradiation but level of knowledge on the benefits, applications, safety of process and safety of irradiated food was low i.e. only 4–7% of respondents have good knowledge (Fig. 1). Current sources of information were from publications such as newspaper, journals, magazines (59%) followed by seminars (46%) and electronic media (11%). Hence the use of electronic media (TV and radio) should be increased for information dissemination food irradiation.

Awareness of respondents on some of the important developments and advances in food irradiation internationally and in Malaysia were also evaluated (Fig. 2). Apparently, 58% of respondents were aware that food irradiation is recognized by FAO, WHO and Codex Alimentarius Commission. However, more than half of the respondents were not aware that irradiation has been commercially used by 28 countries or that tropical food products such as spices and frozen shrimps are irradiated at facilities in the importing countries. Similarly, respondents were not aware of the availability of radiation facilities in Malaysia nor the existence of Malaysian Standard on Guidelines for Irradiation of Food which was formulated in 1992 to assist food industries in applying the technology. In addition, 48% of respondents did not realize that approval is required from the Ministry of Health before using the technology.

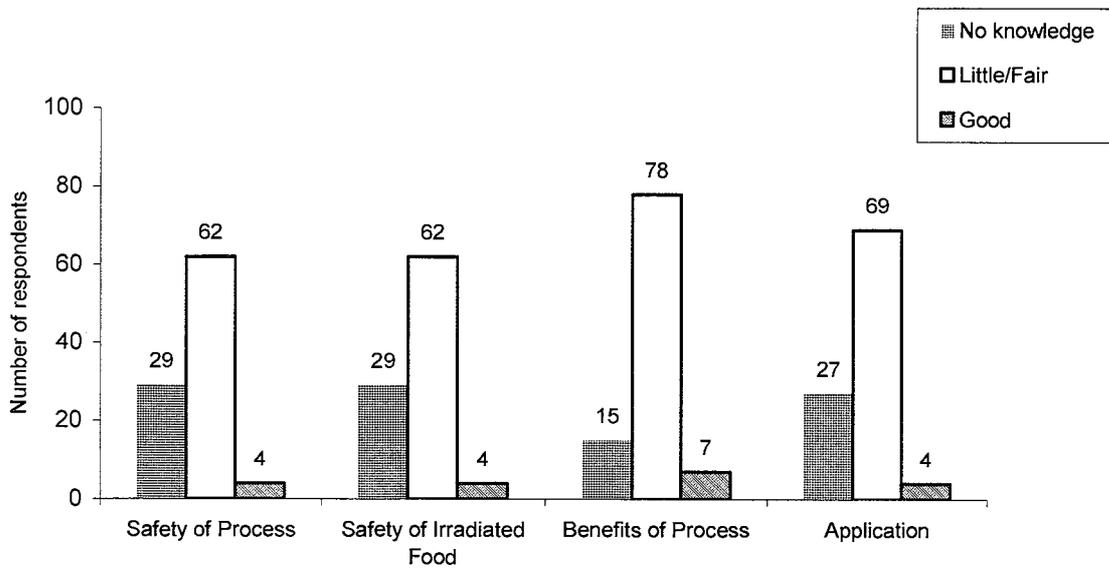


FIG.1. Level of knowledge on food irradiation.

Are you aware that :

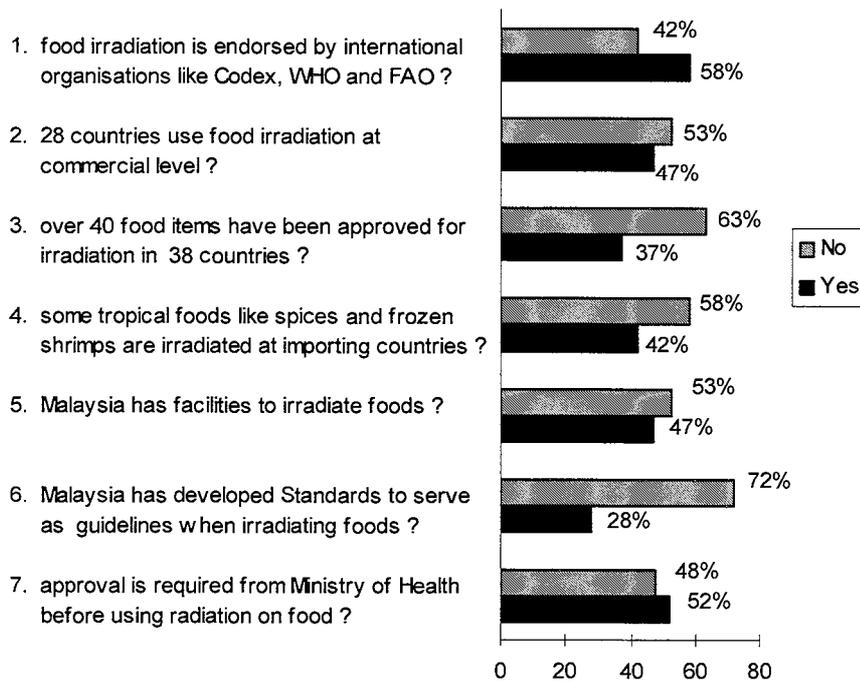


FIG.2. Knowledge on food irradiation developments.

In this study, the perception and willingness to apply the technology is used as an indication of acceptance of food irradiation by food industries. Food irradiation was perceived as safe by half of the respondents as opposed to one respondent who perceived otherwise while remaining 47% were uncertain or formed no opinion (Fig. 3). About 33% of respondents indicated willingness to use irradiation either for research or commercial purposes and a slightly higher number of respondents (43%) will not irradiate their products (Fig. 4). However, more respondents (41%) will consider using imported irradiated ingredients compared to 28% who will not use while 31% were undecided (Fig. 5). Given proper information, the number of potential users are expected to increase.

Among the various applications of food irradiation, its use in reducing spoilage/eliminating pathogenic microorganisms in food products and in sterilizing packaging materials were found to serve the requirements of half of the respondents as an alternative to heat or chemical treatments (Fig. 6). In determining factors affecting commercial application, majority of respondents (90%) considered safety of process, safety of the irradiated food, efficacy of the process and consumer acceptance as high priority compared to cost and environmental effect (Fig. 7). Hence these four factors should be emphasized in securing the acceptance of food irradiation by the food industry.

Findings of the survey suggest that food irradiation is still unknown to majority of Malaysian food processors. However, respondents strongly indicated that food irradiation technology should be promoted in Malaysia. Half of the respondents conveyed interest to conduct research or do product testing while 41% will join efforts in educating the consumers. More than 75% of respondents indicated interest to receive information and visit the radiation facilities at MINT. These information provide MINT with the opportunity to establish further contacts with the food processors for educational/promotional activities.

What is your opinion on the use of irradiation as an alternative food preservation process ?

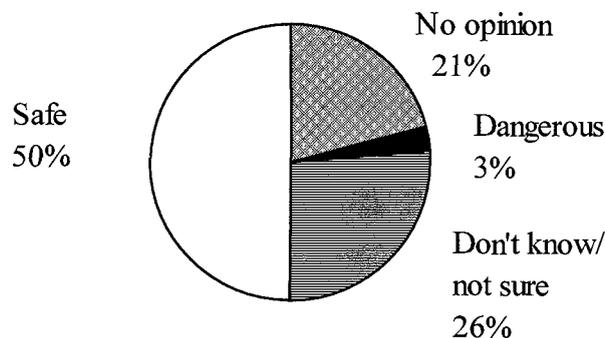


FIG.3. Opinion on food irradiation.

Would you consider using irradiation on your product and for what purpose?

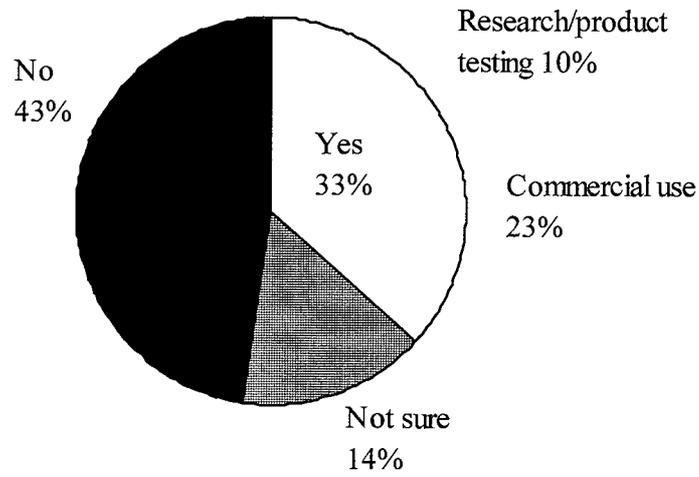


FIG.4. Consider to use irradiation process.

Would you consider using imported irradiated ingredients in your processed food products e.g. spices / seasonings, dried fruits ?

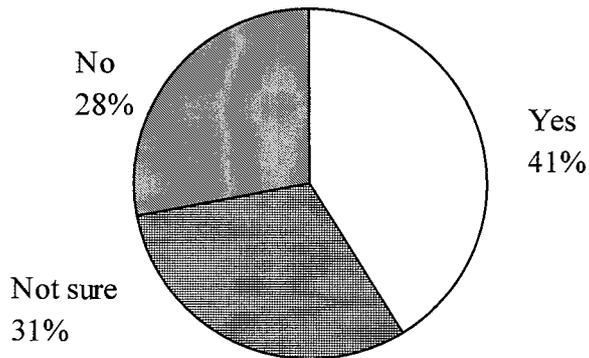


FIG. 5. Consider to use irradiated ingredients.

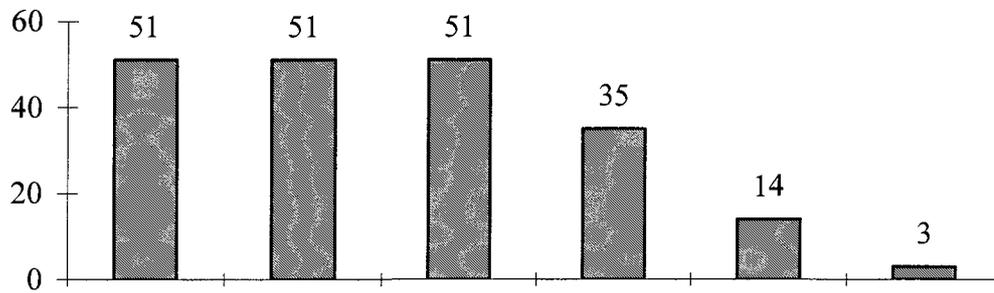


FIG. 6. Potential application of food irradiation by food industry.

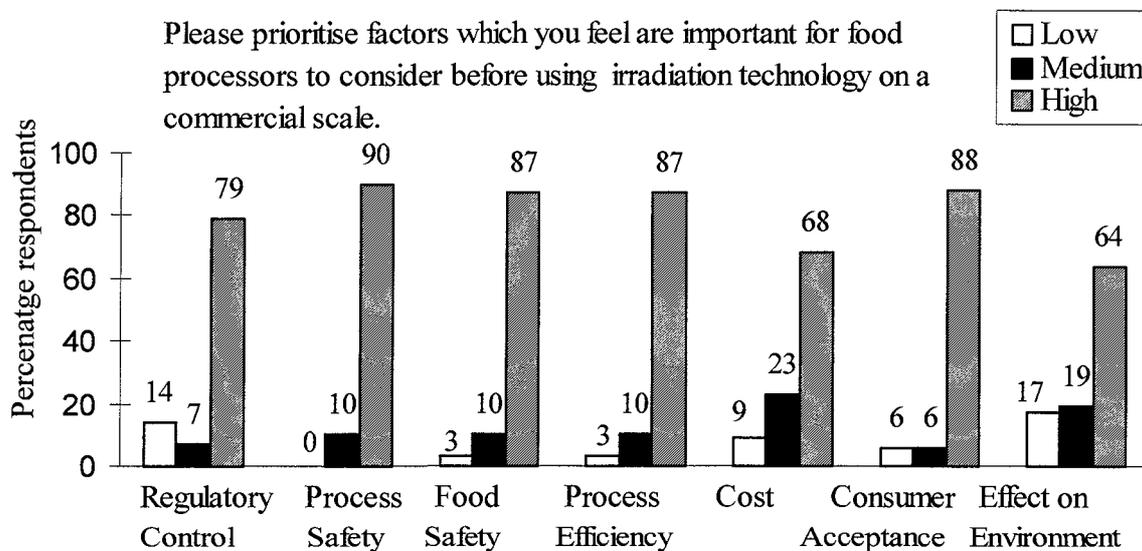


FIG. 7. Factors of concern for commercial application.

3. DEVELOPMENT OF CONSUMER EDUCATION MATERIALS

As in many other countries, food irradiation in Malaysia has attracted much attention from the local activist and media which has led to the misconception among policy makers and food industries that consumers would be reluctant to accept irradiated food. Furthermore, Malaysia used to be the regional base of the infamous anti-food irradiation activism centre in the 1980s and hence, consumers were influenced by the adverse publicity on this technology. As there are no irradiated products in the marketplace yet, it is difficult to assess the Malaysian consumer's response to food irradiation. A survey conducted in 1991 on 1029 consumers indicated ignorance of the process by two-thirds of respondents due to very limited

knowledge and misunderstanding of the technology [6]. The process was perceived as dangerous by 52% of respondents with only 10% convinced it is safe. Initial acceptance was low whereby about 85% of respondents were unwilling to consume irradiated food but the number was reduced to 46% if irradiated food gets safety assurance from the health authority. Nevertheless almost all respondents responded positively towards education on food irradiation.

Findings of the survey indicated that information on food irradiation is presently very limited. To increase acceptance, there is obvious need to make available information materials addressing consumer concerns and highlighting the benefits of this technology. Continuous efforts are underway to produce such education materials by adapting materials developed by ICGFI and other sources, to the Malaysian situation. The compilation of research achievements on food irradiation in Malaysia is currently in progress and due to be ready in early 1999.

4. PROMOTIONAL ACTIVITIES ON FOOD IRRADIATION

Various activities have been conducted to increase awareness and understanding of the food irradiation technology in the past three years. As a follow up to the food industry survey, information materials on food irradiation were sent to all respondents. Visits were made to 5 food processors for further discussion on the technology while 3 others visited the radiation facilities in MINT. Three food processors conducted product testing on chrysanthemum flowers (ingredient for tea), chilled fish products and spices using gamma radiation at our commercial Co-60 irradiator.

Irradiation technology was also introduced to about 130 food processors during a National Technology Connection meeting organized by the Ministry of Science, Technology and the Environment and the Ministry of International Trade to foster commercial linkage between private sector and research institutes. A one-day seminar on "Gamma processing of pharmaceuticals, herbal and cosmetic industries" was organized by MINT which was attended by about 80 representatives from public and private sectors including food industries.

Lectures and IAEA/ICGFI videos on food irradiation were presented to various members of the public during their visit to MINT including students, food control officials, quarantine inspectors and food industry. An article by a journalist highlighting food irradiation was recently published in newspaper without negative feedback from the public or consumer group.

These activities have contributed to the commercial processing of spices and herbs at the Co-60 irradiator Sinagama since end 1997. More than 18,000 kg of spices and 25,000 kg of herbs have been radiation processed for decontamination of microorganisms and the volume is expected to increase as more processors are informed of the advantages of irradiation. As one of the major spice exporter, the banning of ethylene oxide by many importing countries would make irradiation an alternative treatment for improving microbiological quality of spices.

5. CONCLUSIONS

The Malaysian food industry is gradually showing interest on food irradiation technology. However, there remain many factors which delay its commercial application such as lack of clear cut need for the process, cost-benefit, logistics, regulatory control and

uncertainty of consumer acceptance. To ensure successful commercialization, the role of food industries must be strengthened. They should be encouraged to examine their need for this technology and conduct economic feasibility studies on their food products. They should also be involved in consumer education and market testing of irradiated foods which will lead to better understanding and acceptance of the process and products.

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