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MS 1265-9 (2005) (English): CODE OF GOOD IRRADIATION PRACTICE - PART 9: SPICES, HERBS AND VEGETABLE SEASONINGS FOR THE CONTROL OF PATHOGENS AND MICROFLORA (FIRST REVISION)

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MALAYSIAN STANDARD

MS 1265: PART 9:2005

CODE OF GOOD IRRADIATION PRACTICE - PART 9: SPICES, HERBS AND VEGETABLE SEASONINGS FOR THE CONTROL OF PATHOGENS AND MICROFLORA (FIRST REVISION)

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Committee representation

The Food and Agricultural Industry Standards Committee (ISC A) under whose authority this Malaysian Standard was developed, comprises representatives from the following organisations:

Department of Agriculture

Department of Standards Malaysia

Federal Agricultural Marketing Authority

Federation of Malaysian Manufacturers

Malaysian Agricultural Research and Development Institute

Malaysian Association of Standards Users

Malaysian Palm Oil Association

Ministry of Agriculture and Agro-based Industry

Ministry of Health Malaysia

Ministry of International Trade and Industry

Universiti Kebangsaan Malaysia

Universiti Putra Malaysia

The Working Group on Food Irradiation which developed this Malaysian Standard consists of representatives from the following organisations:

Department of Fisheries Malaysia

Department of Veterinary Services Malaysia

Federation of Malaysian Consumers Associations

Malaysian Agricultural Research and Development Institute

Malaysian Institute for Nuclear Technology Research

Ministry of Health Malaysia

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Universiti Putra Malaysia

FOREWORD

This Malaysian Standard was developed by the Working Group on Food Irradiation under the authority of the Food and Agricultural Industry Standards Committee.

MS 1265 consists of the following parts, under the general title *Code of good irradiation practice:*

- Part 1: General

- Part 2: Bulb and tuber crops for sprout inhibition

- Part 3: Fresh fruits and vegetables for insect disinfestations and as quarantine treatment

- Part 4: Cereal grains for insect disinfestations

- Part 5: Dried fish and dried salted fish for insect disinfestations

- Part 6: Bananas, mangoes and papayas for shelf-life extension

- Part 7: Fish, frogs and shrimps for the control microflora

- Part 8: Prepackaged meat and poultry for the control of pathogens and/or to extend shelf-life

- Part 9: Spices, herbs and vegetable seasonings for the control of pathogens and microflora

- Part 10: Dried meat and dried salted meat of animal origin for insect disinfestations, control of moulds and reduction of pathogenic microorganisms

This Malaysian Standard is the first revision of MS 1265: Part 9, *Guidelines for irradiation of foods: Part 9: Irradiation of spices and vegetable seasonings (to control pathogens and other microflora)*

Major modifications in this revision are as follows:

a) herbs have been included in the standard's scope;

b) recommended hygienic conditions have been added in the pre-irradiation treatment;

c) recommended manuals on dosimetry procedures have been updated; and

d) labelling requirements have been amended.

This Malaysian Standard cancels and replaces MS 1265: Part 9:1992, *Guidelines for irradiation of foods: Part 9: Irradiation of spices and vegetable seasonings (to control pathogens and other microflora).*

Compliance with a Malaysian Standard does not of itself confer immunity from legal obligations.

CODE OF GOOD IRRADIATION PRACTICE – PART 9: SPICES, HERBS AND VEGETABLE SEASONINGS FOR THE CONTROL OF PATHOGENS AND MICROFLORA (FIRST REVISION)

0. Introduction

Spices and vegetable seasonings are added to foods for the purpose of affecting the food's taste, flavour, odour or colour in ways that are regarded as desirable. Generally they have no other function as food additives. Usually they are added in small amounts.

1. Scope

1.1 This Malaysian Standard describes the code of good irradiation practice for dry or dried spices, edible herbs and other dry or dried vegetable products used to season food. Generally these ingredients are products of plant origin and may comprise an entire plant or one or more particular parts of a plant. As covered by this standard, they are normally dried to low moisture content. Additionally, some are chopped or ground or otherwise finely divided.

1.2 Excluded from this standard are other dry food ingredients which may be added to foods or used in their preparation for technological purposes (e.g. starch, gums, etc.) and which have functions different from those indicated for spices and vegetable seasonings.

1.3 The purpose of the irradiation is to decontaminate the spices, herbs and vegetable seasonings of microorganisms and/or insect pests. It is not for preservation of these ingredients. (Preservation is obtained through proper drying, packaging and storage of these ingredients).

1.4 The specific purposes of the irradiation treatment are:

a) to reduce the number of pathogenic bacteria below detectable level;

b) to reduce the population of bacteria, moulds and yeasts; and

c) to kill insects present.

2. Normative reference

The following normative reference is indispensable for the application of this standard. For dated reference, only the edition cited applies. For undated reference, the latest edition of the normative reference (including any amendments) applies.

MS 1265: Part 1, *Code of good irradiation practice - Part 1: General*

3. Pre-irradiation treatment

3.1 Irradiation is applied to the forms of these ingredients normally prepared for commercial trade and use. The usual considerations regarding their quality and the use of good manufacturing practices apply. Irradiation cannot be used to correct quality deficiencies. Undue contamination with microorganisms and insects prior to irradiation is to be avoided, and when contamination, appears unavoidable, all possible measures should be taken to make it minimum.

3.2 When tested by appropriate methods of sampling and examination, the untreated spices, herbs and other vegetable seasonings, harvested and handled under acceptable hygienic conditions should contain:

a) not more than 10^4 coliform bacteria per g; and

b) not more than 10^5 mould propagules per g.

4. Packaging

4.1 In order to avoid re-contamination after irradiation, the products should be properly packaged. This is best done before irradiation. Generally, at the dose required, the commonly used packaging materials are satisfactory for irradiated product. They should be functionally and adequately protective. However, when and where irradiation significantly alters functional properties of a particular packaging material or may result in the formation of toxic substances which can transfer by contact to the spices or vegetable seasonings, that packaging material cannot be used.

4.2 Irradiation may brown glass. Therefore, this material may be unsuitable for terminal irradiation (irradiation in final package), whenever the eventually resulting darkening might be a disadvantage. (In some cases, however, brown glass is required for packaging).

4.3 Containers made of wood or other cellulosic material, if exposed to repeated irradiation, may be gradually damaged by it in each successive irradiation and, in time, may become unusable.

4.4 The size and shape of containers which may be used for irradiation are determined in part by certain aspects of the irradiation facility. The critical aspects include the characteristics of product transport systems and of the irradiation source, as they relate to the dose distribution obtained within the container (See Clause 6).

4.5 The irradiation procedure will, therefore, be facilitated if the product packages are geometrically well-defined, particularly, if they are flat-sided rather than round. With certain irradiation facilities, it may be necessary to limit use of product packages to particular shapes and sizes, as they may not accommodate conventional drums or bags or other bulk containers used for shipping commercial spices and seasonings. However, newly designed food irradiators are configured to accommodate such bulk packaging.

5. Pre-irradiation storage and transport

The use of irradiation implies no particular requirement regarding handling of spices and vegetable seasonings during storage and shipment prior to irradiation. It shall only be in accordance with good practice to minimise product damage and contamination and to maintain package integrity.

6. Irradiation

6.1 Facility requirements and operation; process parameters and critical operational control points; ionising radiation sources employed

6.1.1 The requirements and guidance regarding certain irradiation process parameters and irradiation facilities and their operations should be referred to MS 1265: Part 1.

6.1.2 The ionising radiation which may be used for irradiation of spices, herbs and vegetable seasonings is limited to:

a) Gamma rays from the radionuclides Cobalt-60 and Caesium-137;

b) X-rays generated from machine sources operated at or below an energy level of 5 MeV (Million Electron Volts); and

c) Electrons generated from machine sources operated at or below an energy level of 10 MeV.

6.1.3 The selection of the irradiation source to be employed in the treatment should be appropriately considered, for example the use of electrons has its limitations due to their poor penetration ability.

6.1.4 It is not possible to distinguish irradiated from non-irradiated product by inspection. Therefore, it is important that, in the operation of an irradiation facility, any appropriate means, such as physical barriers, be used for keeping the irradiated and non-irradiated product separate.

6.1.5 Indicators which change colour or which otherwise undergo some easily determined and time-stable change when exposed to radiation at the doses required are commercially available. Such devices, common in the radiation-sterilisation industry which is used as a paper sticker (or equivalent) and attached to each product unit, such as a carton, could assist the operator in identifying irradiated product.

6.1.6 It is important to keep adequate records of the operation of the irradiation facility. Fish which have been irradiated should be identified by lot numbers or other suitable means. Such measures which enable verification of the irradiation treatment carried out are likely to be required by the regulatory agencies.

6.2 Amount of radiation used (absorbed dose)

6.2.1 General

6.2.1.1 The most important process parameters in the irradiation treatment of food is the amount of ionizing energy absorbed by the target material. This is termed 'absorbed dose'. The unit of absorbed dose is the Gray (Gy). One Gy is equal to the absorbtion of one joule per kg. The dose employed is determined by the level of the initial contamination (number of organisms), the kind of organisms, and the purpose of the treatment. It is important that the food should receive the minimum absorbed dose required to achieve the desired effect and that uniformity ratio be maintained at an appropriate level.

6.2.1.2 The control of the irradiation procedure so as to deliver a prescribed dose entails a number of considerations, important among which is the technology for measuring dose, which is termed 'dosimetry'. It is recommended that manuals on dosimetry procedures be consulted. Refer to bibliography for the list of references on dosimetry procedures.

6.2.2 Dose for decontamination of spices

6.2.2.1 Spices and vegetable seasonings are of agricultural origin and commonly become contaminated with microorganisms (bacteria, moulds and yeast) and/or insects. The numbers and types of microorganisms and insects vary with the particular material, the location of its origin, climatic conditions encountered, harvesting, processing, storage and transport technologies employed, packaging used, and the general environmental and handling circumstances, including the nature and extent of quality control measures.

6.2.2.2 The absorbed dose necessary to stop further development of insect eggs and larvae in spices and vegetable seasonings will be lower than 1 kGy.

6.2.2.3 The absorbed dose used to reduce the numbers of bacteria and moulds may be specified by the current legislation currently enforced in the country or, in some cases, by international traders.

6.2.2.4 Pathogenic bacteria that may be present in spices, herbs or vegetable seasonings can be inactivated by a relatively low absorbed dose. Microorganisms belonging to the Enterobacteriaceae family are generally susceptible and can generally be killed by 4 kGy - 6 kGy. The number of mesophilic aerobic microbes usually decreases by 2 - 3 orders of magnitude after being treated with 5 kGy. Of the spore forming bacteria the most frequent genus in spices is Bacillus. In general, the number of spores decreases by at least 2 orders of magnitude as a result of irradiation with 5 kGy. The number of anaerobic bacterial spores normally is low and an absorbed dose of 5 kGy kills them. The number of moulds and yeasts is often reduced significantly at an absorbed dose of 5 kGy.

6.2.2.5 From a practical view point an absorbed dose of 3 kGy - 7 kGy at the point of minimum dose rate within the package, is sufficient to decrease the number of microorganisms to an acceptable level (Standard Plate Count below 10^3 - 10^4), in spices, herbs and other vegetable seasonings with an initial count of between 10^5 - 10^7 per gramme, without causing significant chemical changes in spices. The maximum overall average absorbed dose which may be employed is 10 kGy, and tolerated by many spices without any appreciable effect on the sensory qualities. Table 1 provides information on general threshold doses regarding quality impairment in a wide variety of spices.

6.2.2.6 It is to be noted that absorbed doses effective for control of microorganisms are larger than those needed for insects. Therefore, irradiation of spices, herbs and other vegetable seasonings for control of microorganisms also sterilises or kills any insect present, at all stages of development.

6.2.3 Irradiation conditions

Conditions usually practiced for irradiating materials at ambient temperatures may be practiced.

7. Post-irradiation handling and storage

No special requirements exist for the post-irradiation handling of spices and vegetable seasonings. As noted previously, protective packaging, preferably applied before irradiation, serves to prevent recontamination and should be employed.

Table 1. Dose requirement for radiation disinfection of some spices, herbs and dry vegetable seasonings as compared to the retention of their volatile oil content, and threshold doses of organoleptic changes

Product	Dose requirement (kGy)	Relative yield of volatile oils (refer note 1) at 8-10 kGy	Threshold dose of organoleptic changes (kGy)
Allspice	< 6	97-100	15
Anise	< 5	100	-
Basil	4-10	99	12.5
Bay	< 5	-	-
Caraway	< 7.5	88-111	-
Cardamom	< 5	81	7.5
Cayenne	5-6	-	10
Celery leaves	4	97-100	
Celery seeds	6	-	> 10
Charlock	5	-	10
Chive	4-8	-	4-8
Cinnamon	4-5	97	> 10
Clove	> 5	98	< 20
Coriander	< 5	98-120	< 5 but also > 16
Cumin	< 4	100-105	6-10
Curry	6-8	-	> 10
Dilltips	10	-	> 10
Fennel	8	98-123	> 15
Fenugreek	4-10	-	< 5 but also > 10
Garlic Powder	5-7.5	-	3-4.5 but also > 16
Ginger	5-6	66-88	> 10
Juniper	7.5	71-82	> 15
Mace	< 5	95	-
Marjoram	7.5-10	100-103	5-10 but also > 16
Mustard seed	< 5	100-103	> 10

Table 1. Dose requirement for radiation disinfection of some spices, herbs and dry vegetable seasonings as compared to the retention of their volatile oil content, and threshold doses of organoleptic changes *(continued)*

Product	Dose requirement (kGy)	Relative yield of volatile oils (refer note 1) at 8-10 kGy	Threshold dose of organoleptic changes (kGy)
Nutmeg	4-5	87-100	> 10
Onion Powder	4-10	-	< 10/optical index 8-16/flavour
Oregano(marjoram)	< 4	99-100	> 10
Paprika	4-8	-	8-10 but also > 16
Parsley	5-8	-	-
Pepper, black	5-10	67-112	< 10 but also > 16
Pepper, white	5-8	70-102	> 10
Red pepper	< 5	-	> 10
Sage	4	-	10
Savory	-	< 5	
Thyme	5-7.5	101	> 10
Turmeric	5-8	-	5-10 but also >= 10

NOTES:

1. As percentage of the yield of untreated sample.

2. Dose requirements with reference from J. Farkas, *Disinfection, Including Parasite Control, of Dried, Chilled and Frozen Food by Irradiation*, Background Paper to ICGFI Task Force Meeting on the Use of Irradiation to Ensure Hygienic Quality of Food, Vienna, 14-18 July 1986.

8. Labelling

8.1 Foods which have been irradiated shall be labelled and the labelling shall be in accordance with the current national legislation requirements.

8.2 Labelling should not only identify the food as irradiated, but also serve to inform the purchaser as to the purpose and benefits of the treatment.

8.3 Each package containing the food treated by ionising radiation may bear on it the food irradiation symbol given in MS 1265: Part 1.

9. Re-irradiation

Irradiation of the same product more than once generally is not permitted. Exception is made for foods of low moisture content, which may be re-irradiated to control insect infestation. However, where permitted, the total absorbed dose should not exceed that approved. MS 1265: Part 1 may be referred for provisions for irradiation of certain foods.

10. Quality of irradiated spices, herbs and vegetable seasonings

10.1 Irradiation as specified in Clause 6 of this standard, does not alter the quality of spices, herbs and other vegetable seasonings, as measured by usual criteria, such as volatile oil content, aroma profile analysis or colour-pigment content. In general storage of irradiated spices causes no greater loss of quality than that which occurs with non-irradiated spices.

10.2 In terms of quality, irradiation of spices, herbs and other vegetable seasonings is a completely satisfactory procedure for decontamination of these food materials.

Bibliography

MS ISO ASTM 51204: 2005, *Practice for dosimetry in gamma irradiation facilities for food processing*

MS ISO ASTM 51261: 2005, *Guide for selection and calibration of dosimetry systems for radiation*

MS ISO ASTM 51431: 2005, *Practice for dosimetry in electron and bremsstrahlung irradiation facilities for food processing*

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