Phytosanitary treatments
Traitements phytosanitaires

Irradiation of stored products to control stored-product insects in general

Specific scope

This standard describes the use of ionizing radiation to control stored-product insect pests in general. It is an alternative to the standard PM 10/11 *Methyl bromide fumigation of stored products to control stored-product insect pests in general* (previously PM 3/12).

Specific approval and amendment

First approved in 2008-09.

Introduction

Stored products may be infested with different insect pests which affect either the quality of the products by feeding and contamination with excrement or are quarantine insects whose spread should be avoided. Several of these insects are listed in the EPPO A1 or A2 lists. Stored products such as grain, rice and nuts serve as a pathway for quarantine insects.

Commodities/regulated articles

Stored products

Pests

All stored-product insect pests

Treatment schedule

Treatment name: irradiation
Treatment type: ionizing radiation
Irradiation can be carried out using

- Gamma rays from radionuclide cobalt-60 (60_{Co}) or caesium 137 (137_{Cs})
- X-rays, generated from machine sources up to 5 MeV[1]
- High energy electrons derived from an electron beam accelerator (accelerated electrons) of up to 10 MeV.

The unit of measurement for the absorbed dose is gray (Gy).

[1] Limits according to ICGFI (1995).

Using gamma radiation the commodities to be treated may be packed in boxes or containers whereas using accelerated electrons or x-rays the material to be treated has to be transported through the treatment zone on a conveyor-belt or in free fall. Irradiation treatment depending on the dose used leads to prevention of emergence of eggs or larvae, sterilization of adults or the death of the organism (Burditt, 1994). While disinfection of stored products also has the aim of reducing negative effects or losses through feeding of the insects or stages of the insects, the aim of the current treatment is to kill all stored-product insects or at least to inhibit the development of immature stages.

Organism	Commodity	Dose (kGy)
Insects	Stored products	1

Efficacy of treatment

The USDA treatment manual requires for all insect pests, except adults and pupae of the order Lepidoptera in various commodities, a minimum absorbed dose of 400 Gy. Several countries permit a dose of up to 1 kGy for treatment against stored-product insects (Diehl, 1990; FAO/IAEA Programme Clearance of Irradiated Food Database).

Note (warning)

In contrast to gamma radiation the penetration depth of an effective radiation with high energy electrons derived from an

electron beam accelerator or x-rays is limited. Treatment procedures should ensure that the minimum absorbed dose is fully attained throughout the commodity. The requirements of ISPM No. 18 *Guidelines for the use of irradiation as a phytosanitary measure* should be followed (FAO, 2003). Radiation treatment under this standard is not intended to be used for seed, as the single seed will be radiated through the whole cross-section which leads to negative effects or death of the seed. Irradiation does not lead to immediate death of the treated organism. Irradiated insects suffer from 'radiation syndrome' which means that they absorbed a lethal dose and will die within several days or weeks after treatment.

Irradiation at a high dose may affect quality of the product.

References

Burditt AK (1994) Irradiation. In: *Quarantine Treatment for Pests and Food Plants*. (Eds Sharp JL & Hallmann GJ) Westview Press, Denver (US), 101–117.

Diehl JF (1990) *Safety of irradiated Foods*. Marcel Dekker New York (US): 345 pp.

FAO (2003) International standards for phytosanitary measures No. 18. *Guidelines for the use of irradiation as a phytosanitary measure*. FAO, Rome (IT), 23 pp.

ICGFI (1995) *Facts about Food Irradiation*. ICGFI Fact Sheet Series No. 1. CTP Book Printers Cape Town (ZA): 39 pp.

IAEA (2004) *Irradiation as a phytosanitary treatment of food and agricultural commodities. Proceedings of a final research coordination meeting organized by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture 2002*, IAEA-TECDOC-1427, 181 pp.

FAO/IAEA Programme Clearance of Irradiated Food Database http://nucleus.iaea.org/NUCLEUS/nucleus/Content/Applications/FICdb/FoodIrradiationClearances.jsp?module=cif [last retrieved in 2008-04]

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