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METHODS USED IN THE FIELD OF DISINFECTION OF AGRICULTURAL PRODUCTS

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Abstract
This article provides information on physical, chemical, and heat treatment methods used in the field of disinfection of quarantined products, as well as international experience.

Keywords: Quarantine, disinfection, physical, chemical, gamma rays fumigation, dry steam, hot steam.

Introduction

Methods of disinfection of quarantined products

I. Physical method: treatment with high or low temperature

1.Dry steam (hot water, hot steam)

2.Microwave treatment (placing products in an ultra-high frequency field from 500 to several thousand megahertz)

3.Gamma rays (25-1200 Gy (Gray- 1 Gy = 1 joule/kg) irradiation.)

II. Chemical method using various chemicals such as solutions, solids, gases, aerosols

1.Selection of fumigants and their substitutes

- methyl bromide;
- carbon dioxide;
- phosphine;
- formalin;

Methyl bromide; fumigants are mainly used for fumigation of export products, for example (pomegranate, date, Comstock worm from pests) selection principles of various types of pests lack of chemical instability, no adverse effects on products; less toxic to humans; no use of flammable materials;

2.Aerosol

3.Wet processing

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III. Processing by mechanical methods (traps, sifting dry products, etc.)

Heat treatment

In heat treatment, various energy sources and processes can be used to achieve the required decontamination indicators. For example, steaming, drying in a hot chamber, pressure and heat absorption of a chemical substance, dielectric heating (in a microwave or induction furnace) - these methods can be considered heat treatment if they are carried out in accordance with all the requirements specified in international standards.

The heat chamber must be hermetically sealed and insulated against heat loss. The main requirement when using steaming technology in a heat chamber is to heat the wood to a minimum of 56 ℃ throughout the entire thickness (including the core) and maintain it continuously for at least 30 minutes. In this case, the temperature sensor sensors are placed 30 cm from the end of the wood in the core.

Figure 1. Evaporation technology in a heat chamber

Dry steam treatment – (Kiln drying) is a classic method of combating insects and fungi in Western Europe. Special kilns are used for dry steam treatment. This method is used only for wood products.

Figure 2. Special oven for dry steam treatment)

Dielectric heating in thermal disinfection (Microwave and induction).

This direction is the most effective, environmentally friendly method, which involves the conversion of electromagnetic energy into thermal energy. Microwave disinfection is based on the dielectric heating effect of products that are relatively poor conductors of electricity. An attractive

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feature of the fight against insects using microwave energy is that insects, due to their high moisture content, heat up and die faster than the product. Thus, it is possible to heat insects to a lethal temperature due to their high humidity, without affecting drier products or leaving them slightly warm.

During the disinfection of wood products by microwave treatment, dry wood practically does not heat up, while insects in the wood heat up to the point of death.
Wood-eating beetles die when the temperature reaches 50℃ at 1500 watts of energy.
In the microwave treatment method, the wood packaging material must be heated continuously for 1 minute at a minimum temperature of 60oC throughout its entire thickness. For simultaneous heating of wood with a width of more than 5 cm at a frequency of 2.45 GHz, it is necessary to use a wave transmitter from two or more sides.
In the microwave device, a magnetic field of 40℃, 45℃, 50℃ degrees is created on the grain products. Seeds intended for sowing are treated for a short period, and for disinfection against various grain pests (causing open and hidden damage to grains) (small flour mite, Surinamese flour beetle, southern barn moth, leatherworms, etc.) for a longer period. In both cases, the efficiency is high.

Gamma radiation disinfection effectively destroys pests of stored grains and field crops. Degenerative changes occur in the cells of pests. As a result, the normal development and reproduction of pests is limited. This method is an environmentally friendly technology for pest control. Gamma radiation is effective when treated with 25-1200 Gy (CI unit of absorbed dose Gray: 1 Gy = 1 Joule/kg).
All of the above methods of disinfection are quite effective, but require significant financial costs.

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