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Application of Low Energy Electron Beam in Microbiological Decontamination Process

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Food preservation with ionizing radiation has about 100 years of history. To date, more than 50 countries have given approval for over 60 products to be irradiated. The most popular is application of gamma irradiators. The increasing interest is also observed for application of high energy electrons as well as x-rays. New trend in application of this technology is related to use of low energy electron beam, characterized with limited penetration depth. In the process with the use of high energy electrons, the whole volume of food is irradiated. Since microorganism reside mostly on the surface of dry food, irradiation of external layer should be sufficient to eliminate food-borne microorganisms. Additionally the operation safety issue is also important, since low energy EB machines are equipped in local compact shielding and can be installed along with other industrial machinery in same room

Presented study concentrates on determination of microbiological decontamination process efficiency with the use of e-beam of energy between 300 and 100 keV. Two electron accelerators installed in INCT were be used in experiments. Elektronika (10 MeV, 10 kW) was applied for irradiation with high energy electrons. Accelerator ILU-6 is a resonant type machine which nominal operating range of the beam covers the energy range from 600keV to 2MeV. Low electrons energy was achieved by reducing the accelerating RF voltage. For the need of this study the modification in pulse power supply system, arrangement of electron gun and beam sweep system of accelerator ILU-6 was performed to lower energy of emitted electrons below 300 keV. The energy of used electron beam was controlled using stack of B3 dosimetric film.

In the experiments the microbiological load reduction was tested for food products, irradiated with doses from 1 to 10 kGy. Selected samples of spices, dries herbs and seasonings with different density and porosity were tested to control total amount of aerobic bacteria and mould. The relationship between dose of radiation for different energies of electrons and effectiveness of the process was established. The effects of irradiation with low energy electrons were compared with effects for high energy electrons.

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Country/Organization invited to participate

Poland

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