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Food Preservation Techniques by Irradiation

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About the Study

Ultraviolet (UV) light is an incredible bactericidal agent, with the most effective wavelength being around 2,600 A. It is nonionizing and is absorbed by proteins and nucleic acids, in which photochemical changes are created that might prompt cell death. The mechanism of UV death in the bacterial cell is because of the production of deadly mutations because of activity on cell nucleic acids. The poor penetrative capability of UV light restrict its food use to surface applications, where it might catalyze oxidative changes that lead to rancidity, stains, and different reactions. Small portions of ozone may likewise be created when UV light is utilized for the surface treatment of specific food sources. UV light is in some cases used to treat the surfaces of baked fruit cakes and related items prior to wrapping.

UV wavelengths are categorized as UVC (100nm～280 nm), UVB (280nm～315 nm) and UVA (315 nm～400 nm). UVC light has bactericidal effect which means they are lethal to bacteria. UVC wavelength impairs bacterial DNA. The DNA damage also leads to the repression of its transcription and replication and finally induces to cell death. UVB light has the same effects to DNA, especially on oral bacteria.

Beta rays can be described as a beam of electrons transmitted from radioactive substances. Cathode beams are something very similar with the exception of that they are transmitted from the cathode of an evacuated tube. These beams have less penetration power. Among the commercial sources of cathode beams are Van de Graaff generators and linear accelerators. These linear accelerators appear to be more suitable for food preservation. There is some concern over the upper limit of energy level of cathode beams that can be utilized without actuating radioactivity in specific constituents of food varieties.

These are electromagnetic radiations discharged from the excited nucleus of elements like 60Co and 137Cs, which are of significance in food preservation. This is the least expensive type of radiation for food preservation, in light of the fact that the source components are either results of atomic fission or atomic waste products. Gamma beams have incredible penetration power than beta beams. 60Co has a half-life of around 5 years; the half-life for 137Cs is around 30 years. These beams are produced by the bombardment of heavy-metal targets with high- velocity electrons (cathode beams) inside an evacuated tube. They are basically equivalent to gamma beams in different regards.

When electrically neutral food sources are set in an electromagnetic field, the charged asymmetric particles are driven initially one way and then another. During this process, each asymmetric molecule attempts to align itself with the rapidly changing alternating-current field. As the particles oscillate about their axes while endeavoring to go to the appropriate positive and negative poles, intermolecular friction is made and showed as a heating effect. This is microwave energy. Most food research has been done at two frequencies: 915 and 2,450 megacycles. At the microwave frequency of 915 megacycles, the particles oscillate to and fro 915 million times for every second. Microwaves lie between the infrared and radio frequency portions of the electromagnetic spectrum.

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