

Comparative Effect of Electrolysed Oxidising Water and Ionization Radiation in Food Preservation



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Short Communication

The Non thermal methods of food preservation by controlling the activity of microbes both pathogenic and spoilage have been great achievement of recent origin. The two different methods of controlling microorganisms in food system are EO water which was introduced first in Japan around 1981 and food irradiation preservation which was introduced in US army Natick lab [1]. The method of preservation is going acceptance as an alternative & effective tool for commercial application. The mechanism of action of both the technology will be discussed one by one. The acceptance of EO water as an alternative effective sanitizer has low corrosion potential and improved safety for worker. Many commercial EO water generates that produces hypochlorous sanitizer electrolytically from sodium chloride in aqueous solution become available for food in food industries. EO water effectively inactivates both pathogens and spoilage bacteria through oxidative change to the microbial cells.

Several examples of inhibition of cell suspension of bacteria and bacterial biofilm have shown good results. Their ability to kill food pathogens such as *Listeria monocytogenes*, *Escherichia coli*, *Salmonella* species, *Vibrio parahaemolyticus*, *Pseudomonas* species [2,3]. EO water when used for preservation or neutralization to prevent corrosion and minimizing the possibility of cross contamination [4]. EO water did not cause significant loss in weight for stainless steel, aluminium and copper but had significant effect on carbon steel [4]. Chlorine is well known sanitizer & antimicrobial agent highly used in fish industry to their low cost & broad spectrum bacteriological activity [5,6]. EO water has gained uptake in food application due to convenient for use in factories. In ionization preservation, radiation has ability to ionize individual atoms or molecules thereby producing an electron and positively charged ions.



In ionization preservation the gamma rays and electron beams are being used with high energies. When these ionizing

rays collide with the food system the photoelectric effect is produced. These results in absorption of photon energies by the atoms with resulting ejection of orbital electrons and then radiation energy partly converted to kinetic energies. Now the ejected photon goes with reduced energies.

According to the equation:

$$h\nu = \Phi + \frac{1}{2} \left(mv^2 \right) + h\nu'$$

Where ν' is the frequency of scattered photons

ϕ is the binding energy of electron

v is the velocity of electron

ν is the frequency of electron

Ionising radiations produced chemical changes in liquid and solid food system. Ionising radiation splits the water technically we call radioactive water. All food systems are aqueous biological system and hence the effect on water is of key importance. The ionising radiation produces the following intermediates viz., excited water (H_2O^*), free radical (OH^*H^{\bullet}), Ionised water molecules (H_2O^+), hydrated electrons (e^- aqueous). Inter-reactions of these radicals results in the formation of hydrogen gas, hydrogen peroxide, water, hydronium ion and hydroxide ion. The reactions that these intermediates can undergo with food components are too numerous to be listed. All the nutrients present in food viz., carbohydrate, proteins and other nitrogenous compounds, fats and oils; vitamins, enzymes and pigments can react with some of the intermediates to produce new intermediates compounds, many of which are highly reactive. Though these radicals produced antimicrobial effect but in direct action on hydrocarbon chain i.e. a number of primary events occur. Primary hydrocarbon chains are present both in lipid as well as in carbohydrate materials. The most important

event is the extraction of hydrogen and the concurrent formation of free radicals.



Irradiation poses harmful effects on the food system as discussed earlier that's why the application of irradiation is restricted to the inhibition of sprouting in food and killing of insects. While the concept of EO water is applied in broad sense everywhere in the industries and it has been approved by some authorities for the use in the food industries. On the basis of above discussion the use of EO water recommended over the irradiation method on food system.

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