

Control of Microbial Contamination by Electrolyzed Water in Tofu Manufacturing

Tofu is a popular processed food in Asia, and recently, it has become popular worldwide as a health food containing high contents of essential amino acids and isoflavone. Since the consumption of tofu is gradually increasing, it becomes very important to maintain hygienic conditions during its manufacture. Especially, the control of heat-resistant spore-forming bacteria, which are predominant on the surface of soybean, is an essential part of tofu manufacturing. This report describes the potential of electrolysed water to control microbial contamination in tofu manufacturing.

Electrolysed water

Electrolysed water can be produced by electrolyzing sodium chloride solution or dilute hydrochloric acid. Electrolysed water is classified into 3 types:

- A-Anolyte: acidic electrolysed water (germicidal, used for hygienic purposes),
- Aquastel Water: alkaline ionised water (having medical effects; drinking water),
- K-Catholyte: alkaline electrolysed water (lipid-detergent).

Scientific evidences concerning electrolysed water increased in the 1990s and some industrial applications were also developed. Nowadays, acidic electrolysed water is used to sanitize food-processing equipment and fresh-cut vegetables in food industries.

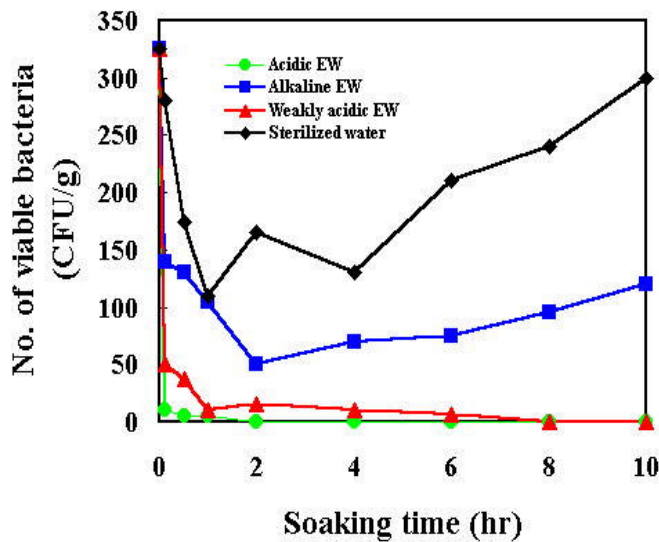
Utilization of electrolysed water for soaking soybeans

Microbial contamination could be effectively eliminated by using electrolysed water. We soaked soybean in 3 types of electrolysed water:

- A-Anolyte at pH 2.1, 1185 mV oxidation-reduction potential (ORP) and 100 ppm chloride,
- K-Catholyte at pH 11.7, -120 mV ORP,
- and AN-Anolyte a mixture (weak acidic electrolyzed water) of both waters at pH 6.5, 891 mV ORP, and 50 ppm chloride.

Microbial population of the water became negligible after only 30 min. of treatment in acidic electrolysed water and 1 hour in the mixture, while physico-chemical characteristics of tofu and milk made from soybean thus treated were not changed at all. Electrolysed water is however very unstable and should be prepared only at the time of use. Moreover, acidic

and weak acidic electrolysed water are easily inactivated when polluted by organic matter; therefore, it is necessary to always protect them from pollution and to preliminarily wash the manufacturing lines with electrolysed water before use. In order to apply electrolysed water in processing of other foods, similar analyses of the efficiency, stability, and reactivity (safety) of electrolysed water in the presence of other organic materials are needed.



Changes in viable bacteria populations in soybeans soaked in electrolysed water.

Effects of electrolysed water on soybean, soybean milk, and tofu

	Alkaline EW* K-Catholyte	Acidic EW A-Anolyte	Weak acidic EW AN-Anolyte	Sterilised water
Water absorbency of soybeans (%)	120.6	112.6	114.0	116.1
Solid content in soaked water (%)	0.51	0.47	0.37	0.32
Yield of soybean milk (ml**)	232.9	230.6	229.1	227.4
Solid content in soybean milk (%)	10.85	11.04	10.60	10.64
Tofu gel strength (kPa)	15.14	15.90	17.68	17.78

EW*: Electrolysed water

**ml: Yield of soybean milk extracted from 50 g of dry seed.

Eizo Tatsumi

Food Science & Technology Division, JIRCAS