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Review Article

WEAK ORGANIC ACIDS IN FOOD TECHNOLOGY

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Weak organic acids are frequently used as an inexpensive and effective intervention to reduce number and prevalence of bacterial pathogens on food products. Of all organic acids evaluated in the literature, acetic and lactic acid are found to be the most acceptable.

Mechanism of Inactivation

The mechanism of inactivation by weak organic acids lays down in the ability of undissociated form of organic acid to penetrate through the cell membrane, and to dissociate inside the cell, resulting in decreased intracellular pH value, which is essential for the control of ATP synthesis, RNA and protein synthesis, DNA replication and cell growth (Booth, 1985). Beside the decrease in intracellular pH, the perturbation of the membrane functions by organic acid molecule might be also responsible for the microbial inactivation. The high concentration of anions (due to dissociation) inside the cells might result in an increased osmolarity and consequently to the metabolic perturbation (Hirshfield *et al*., 2003).

As for other non-thermal inactivation treatments, the microbial sub-lethal injury might occur when the decontamination with organic acids is applied (Lee *et al*., 2002; Liao *et al*., 2003). Alexandrou *et al*. (1995) reported that weak organic acids such as acetic and lactic acid showed greater ability to inflict the subpopulation of sub-lethal injured cells than stronger hydrochloric acid

Factors affecting

The efficiency of organic acid solutions also increased with the decrease of pH in the solution (Van Netten *et al*.,1994). The Gram-positive bacteria are more susceptible to the action of compounds interfering with the transport of ions across the cell (Raftari *et al*., 2009)

Uses and applications

Decontamination of carcasses with organic acid showed minimal effect on the sensory quality of meat (Pipek *et al*., 2005). The application of 2% lactic acid spray solution on beef

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carcasses and chicken breasts has been effective in reducing population of *E. coli* O157:H7 for more than 1.5 log CFU/cm^2, and (Kalchayanand *et al*., 2008).

Commercial status

Organic acids such as lactic, citric and acetic acids at concentration of 1.5–2.5% have been approved as acceptable innervations for reduction of microbial pathogens on meat carcasses in the United States (FSIS, 1996). European Union recently provided the legal bases to permit the use of substances other than potable, clean water to decontaminate products of animal origin (EU, 2004).

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