

EFFECT OF ELECTRODIALYSIS ON DAIRY BY-PRODUCTS MICROBIOLOGICAL INDICATORS

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Abstract

The microbiological aspects of membrane processing of dairy by-products have been studied mainly in relation to the formation of biofilms during ultrafiltration and reverse osmosis. Electrodialysis allows to adjust the salt content and reduce the acidity of the whey, however, it is a long process during which different groups of microorganisms in the raw material can multiply and form biofilms. The purpose of this research was to study the effect of electrodialysis temperature on microbiological indicators of natural and condensed dry solids of curd and cheese whey and skim milk permeate.

We investigated the effect of electrodialysis temperature on microbiological indicators (mesophilic aerobic plate count, spore-forming bacteria, yeast, molds, and coliforms) on natural and condensed to 20% dry solids samples of curd whey, cheese whey and skim milk permeate. Electrodialysis treatment of samples was carried out at the ED (R) -Y/50 facility of the Czech company Mega at temperatures of: 15, 22, and 30 °C. Analysis of microbiological indicators was carried out using 3M™ Petrifilm™.

Electrodialysis at 15 °C does not have a significant impact on the development of the studied groups of microorganisms in all types of raw materials. Electrodialysis at 22 °C contributes to the slow development of some microorganisms. Electrodialysis at 30 °C leads to a significant increase in the aerobic plate count of natural cheese whey ($\Delta \lg N = 0.49$), the number of yeast in natural ($\Delta \lg N = 1.12$) and condensed ($\Delta \lg N = 0.65$) curd whey, and also in natural permeate ($\Delta \lg N = 0.50$). Stimulation of the growth of yeast during electrodialysis of curd whey may be due to favorable pH, active mixing and aeration. Increasing of spore-forming bacteria during electrodialysis at 30 °C can be explained by the formation of biofilms on the membranes. The suppression of microbial growth during electrodialysis was found for mesophilic aerobic plate count in permeate, as well as for coliforms in all types of natural raw materials at 30 °C.

Electrodialysis can be carried out without significant deterioration of microbiological indicators on all the studied types of raw materials at 15 °C and 20 °C, on condensed permeate at 30 °C.

Key words: Dairy by-products, Electrodialysis, Temperature effect, Microbiological indicators.