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SKIM MILK CRYOCONCENTRATION AND ASSESSMENT OF ITS PHYSICO-CHEMICAL, THERMAL AND FUNCTIONAL PROPERTIES

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ABSTRACT Cryoconcentration is a phenomenon which occurs during the thawing of frozen aqueous solution. More concentrated phase is then separated from the initial solution. This phenomenon can be exploited in the bio-food industry to obtain products of high nutritive, biological and organoleptic values. Cryoconcentration was successfully used to concentrate skim milk. In the present research two objectives were studied. The first was aimed to optimize the cryoconcentration process by minimizing the amount of dry matter entrapped in the ice fraction. This was possible by recycling the ice fraction. According to the used experimental conditions, it was possible to concentrate skim milk up to $35.68 \pm 0.03\%$ (w/w) total dry matter using three cryoconcentration cycles. At the same time, one recycling ice cycle was used to minimize loss of dry matter and enhance the process efficiency. Denaturation effect of the freeze/thaw procedure was evaluated by DSC and FTIR analysis. The second objective of the present study was to evaluate physico-chemical and functional properties of the concentrated fractions. Two functional properties were studied: emulsifying and foaming properties. The obtained results showed that both the emulsion stability index (ESI) and the emulsion activity index (EAI) were cryoconcentration cycle dependent. Foaming ability was expressed as nitrogen volume needed to obtain foam volume three times higher than the initial volume. The obtained results also showed a dependency of the foaming ability from the cryoconcentration cycle. The obtained results from this study are promising in the cheese making industry.

Keywords: Skim milk, Cryoconcentration, Efficiency, Protein, Denaturation.