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DEVELOPMENT OF METHODS FOR MONITORING COD DESALTING PROCESS BASED ON FLOW INJECTION ANALYSIS AND FOURIER-MID INFRARED SPECTROSCOPY

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Two analytical methods were developed for monitoring the variation of sodium chloride concentration during the cod desalting process. The developed flow injection analysis (FIA) system was based on the reaction between chloride and silver nitrate, and the formed precipitate was assessed spectrophotometrically as a turbidity change. The different chemical and physical FIA parameters were studied and the use of two different colloids, polyvinyl alcohol (PVA) and gelatin were compared. A Fourier-mid infrared spectroscopy (FT-MID) Golden-Gate attenuated total reflection (ATR) method was also applied.

Although the limit of detection (LD) values for the FIA-PVA and gelatine were comparable (0.039 and 0.035 g L⁻¹), the sensitivity of the FIA-PVA was higher. The reproducibility of the developed system with the two colloids was assessed from five calibration curves performed during 2 months period; sensitivity and standard error values of 0.0020 ± 0.0001 L mg⁻¹ for the FIA-PVA system and 0.00064 ± 0.00002 L mg⁻¹ for the FIA-gelatine system were obtained. The repeatability (RSD) values for the FIA-PVA system ranged between 2.6 to 3.8% (n=10) and for the FIA-gelatine the RSD values were between 4.0 and 8.3% (n=10). Along a 48 h desalting process, samples of cod extracts and brine were taken and analysed by the FIA-PVA system as well as by the reference procedure. The relative deviation (RD) found between the FIA methodology for the cod extracts vs. the reference methodology showed values between -4.8 and 27%, while for the brine samples these RD values were between -9.5 and -4.8%. A determination throughput of 40 h⁻¹ was obtained.

In relation to the FT-MID, the PCA analysis of the spectrum of chloride standard solutions ranging from 1 to 20% (w/v) showed that linearity is observed with the increase of the NaCl concentration. The PLS1 showed that the experimental points fit well to a straight line (R² = 0.9996, LV = 2, RMSECV = 1.8%). The limit of detection was 5 g L⁻¹. Comparing the results obtained by the FT-MIR vs. the reference methodology, the RD values of the NaCl determination for the cod extracts were between 0 to -27.3% and, for the brine samples, RD values were between -10.0 to -3.2%. The determination frequency using this methodology was 20 h⁻¹.

In this work, the successful application of two analytical procedures for the determination of NaCl in cod and brine samples during a simulated desalting process is demonstrated and some of their features are presented.

Keywords: NaCl, food-quality, FIA, FT-MID-ATR, cod-fish-desalting

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