QUANTITATIVE ANALYSIS OF GELATO POWDERS USING NEAR INFRARED DIFFUSE REFLECTANCE SPECTROSCOPY

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SUMMARY

Introduction. The products from gelato industry can be synthesised in different type of pastes and mixed powders. Powder mixing is an important process step in the manufacture of gelato products. In order to characterize, optimize and control the mixing process, the mixture composition must be monitored. The objective of this experiment is to present a method for a quantitative monitoring of powder mixtures compositions using FT-NIR.

Material and Method. Mixed powder were composed by fortmilk, powder milk, dextrose, maltodextrine, lamequick, mighty soft, thickeners and aroma. Powder samples for calibration were prepared using the production receipt, changing one at the time the quantity of: fortmilk, lamequick, mixed sugars and mixed thickeners. Diffuse reflectance spectra were obtained by means of an FT-NIR spectrometer (MATRIX™-I, Bruker Optics, MA, USA) equipped with an integrating sphere in the sampling area. This method is ideal for analysing inhomogeneous samples. Spectral data were acquired in the 800-2500 nm range, with 8 nm of resolution (as an average of 100 scans). For each type of mixture PCA and PLS analyses were carried out in order to set up models to predict the quantity of the variable ingredient.

Results and discussions: The statistical parameters were obtained, for each type of ingredient and quantity reference parameter, carrying out PLS regression analyses in the spectral range 1343-2355 nm for fortmilk, 1639-1836 nm for lamequick, 1126-2175 nm for sugars and 1333-2175 nm for thickeners. The best predictive models obtained for the regressions carried out on fortmilk, lamequick, sugars and thickeners had $R^2$ values of 0.960, 0.974, 0.984 and 0.952, respectively. The best prediction model was found for the prediction of sugars quantity due the fact that there was no interference by ingredients with similar structure in the gelato powder. The RMSEP percentage value for all the above mentioned models was about 2%.

Conclusions. Diffuse reflectance FT-NIR spectroscopy, conduced by means of integrating sphere, appeared to be able to discriminate mixed powders in function of their composition, emerging as a major technique for the mix composition analysis.

REFERENCE


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