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NIR HYPERSPECTRAL IMAGING AND MULTIVARIATE IMAGE ANALYSIS FOR THE DETERMINATION OF THE RIND PERCENTAGE IN GRATED PARMIGIANO REGGIANO CHEESE

R. Calvini¹, S. Michelini², G. Ligabue², A. Ulrici¹

¹*Centro Interdipartimentale BIOGEST-SITEIA, Università di Modena e Reggio Emilia, Reggio Emilia, Italy*

²*Consorzio del Formaggio Parmigiano Reggiano, Reggio Emilia, Italy*

Commercial products of grated Parmigiano Reggiano cheese should not contain an amount of rind higher than 18% (w/w), as ruled by the Specification of Parmigiano Reggiano cheese. Currently, single point near infrared (NIR) spectroscopy is successfully employed to perform fast and non-destructive control procedures to verify product compliance in grated cheese samples [1]. However, it has to be considered that grated cheese contains particles derived from both cheese pulp and rind, resulting in a quite heterogeneous food matrix.

For these reasons, in the present study the use of NIR hyperspectral imaging (HSI), which allows to obtain both spectral and spatial information from a sample, has been evaluated as an effective analytical tool in order to improve the control procedures of Parmigiano Reggiano grated cheese.

To this aim, hyperspectral images of grated cheese samples containing varying percentages of rind were acquired in the 900-1700 nm range. After some preliminary image elaboration steps, including standardization, cropping, background removal and erosion, the hyperspectral images were used to calculate calibration models able to predict the amount of rind contained in the imaged samples. More in detail, the whole dataset of hyperspectral images has been converted into a matrix of signals, namely the *hyperspectrograms*, each one acting like a fingerprint able to codify for the relevant spatial and spectral information contained in the corresponding original image [2, 3]. Then, the hyperspectrogram matrix was used to calculate the calibration models by means of Partial Least Squares (PLS) algorithm. The results obtained with the proposed approach were compared with the current control procedures based on single point NIR spectroscopy, reaching a 20% decrease of the prediction error.

References

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