USE OF NEAR-INFRARED SPECTROSCOPY AND DIGITAL IMAGES TO INVESTIGATE MASTITIS IN COW MILK

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Abstract

Mastitis is a common and costly infectious disease in dairy cattle. The method normally used for mastitis detection is mostly done by subjective visual inspection of the cows in the milking barn during milking and by observing foremilk. Mastitis can be also related to the number of somatic cells in milk. The aim of this study was to investigate the use of near-infrared spectroscopy (NIRS) and digital colour images for the identification of somatic cells in milk. All spectra were acquired in absorbance mode using a PerkinElmer 100N FT-NIR spectrometer, equipped with a quartz sample cell, in the range 4000 - 10000 cm^{-1} with a 4 nm resolution. A second procedure was made by mixing 5 mL of milk with 100 µL of bromocresol purple (0.02 mg / 100 mL) in a beaker (10 mL). These beakers were placed on HP scanner, model CM1213, which is a common table scanner for home use, and the images were recorded. All images were 24-bit RGB (red green blue), 16.8 million colours, with 300 dpi resolution. These images were imported to the Matlab workspace and histograms were calculated: R,G, B, lightness (L), hue (H), saturation (S), intensity (I), and the three relative colours, i.e., relative red (RR),relative green (RG) and relative blue (RB). For each image a one dimensional signal was formed, the colourgram, of length equal to 2560 points (256×10), which describes the colour properties of the image. The milk samples analyzed had different somatic cells count: 128000, 454000 and 816000. The experimental results were analyzed using principal component analysis (PCA). The scores plot obtained by PCA of the NIRS spectra showed that PC1 describes around 77 % of the total variance and it is responsible for the separation of the samples in three groups according to thesomatic cells count. The similar result was obtained with the digital colour images. These results indicate that the use of images can produce reliable chemometric models for verification the cow milk quality.