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Evaluation of portable near-infrared spectroscopy for organic milk authentication

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## Abstract

Organic products are vulnerable to fraud due to their premium price. Analytical methodology helps to manage the risk of fraud and due to the miniaturization of equipment, tests may nowadays even be rapidly applied on-site. The current study aimed to evaluate portable near infrared spectroscopy (NIRS) in combination with chemometrics to distinguish organic milk from other types of milk, and compare its performance with benchtop NIRS and fatty acid profiling by gas chromatography. The sample set included 37 organic retail milks and 50 non-organic retail milks (of which 36 conventional and 14 green 'pasture' milks). Partial least squares discriminant analysis was performed to build classification models and kernel density estimation (KDE) functions were calculated to generate non-parametric distributions for samples' class probabilities. These distributions showed that portable NIRS was successful to distinguish organic milks from conventional milks, and so were benchtop NIRS and fatty acid profiling procedures. However, it was less successful when 'pasture' milks were considered too, since their patterns occasionally resembled those of the organic milk group. Fatty acid profiling was capable of distinguishing organic milks from both non-organic milks though, including the 'pasture' milks. This comparative study revealed that the classification performance of the portable NIRS for this application was similar to that of the benchtop NIRS.

**Key words:** authentication; class probability; FT-NIRS; Micro-NIRS; organic milk

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