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Performance of NIR handheld spectrometers for the detection of counterfeit tablets

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Abstract

Near Infrared (NIR) spectroscopy is an attractive tool for pharmaceutical analyses. While lab spectrometers are very performant, they are expensive and due to their size, not adapted for field analyses. In this study, two handheld NIR spectrometers have been evaluated for the fast detection of counterfeits of pharmaceutical tablets: one low cost sensor providing a short wavelength NIR range (swNIR) and one handheld spectrometer providing a classical NIR range (cNIR).

A large database containing almost all the tablets produced by the firm was created on each spectrometer. A screening for supervised classifications was performed in order to determine the most accurate model for product authentication. A Support Vector Machine (SVM) model was finally chosen for the swNIR, providing 100% of correct identification in calibration and 96.0% in validation, and a Linear Discriminant Analysis (LDA) model was chosen for the cNIR delivering 99.9% of correct identification in calibration and 91.1% in validation. Challenging samples (counterfeits and generics) could be 100% identified by the chosen classifiers combined with a class name check and a correlation distance. Statistical tests were used to compare the performance of selected swNIR and cNIR models. These results demonstrate that both devices can be used for tablet identification and the detection of counterfeits.

Keywords: Near infrared spectroscopy, handheld devices, pharmaceutical tablets, counterfeits, chemometrics

1. Introduction

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