Tablet Hardness Testing using Near Infrared Spectroscopy

S.S.S Rodrigues[1], R.A. Ventura[1], K.F. Soares[1], I.L. Soares[1], D.L Porto[2], K.M.G Lima[1*]

[1]Departament of Chemical, UFRN, Natal, 59072-970, Brazil
[2]Centre Research in Food and Drug, UFRN, Natal, 59072-970, Brazil
*Corresponding author: kassio@ufrnet.br

Introduction:

This work used NIR spectroscopy and multivariate calibration to determine hardness in tablets content four actives principle (isoniazid, rifampicin, ethambutol, pyrazinamide) for treatment of pulmonary tuberculosis produced by UFRN. Current methods of tablet hardness testing are destructive in nature and may not always an accurate representation of the batch being evaluated.

Materials and Methods:

NIR reflectance spectra (in triplicate) of 157 samples were measured using an FT-NIR Bomem MB 160 spectrophotometer in the 800-2500 nm range. Each measured spectra was the average of 50 scans, obtained with resolution of 8 cm^{-1}. The same 157 tablets, the hardness was measured using the durometer hardness Varian VK200. This order of testing allowed direct correlation of data to a specific tablet sample. Spectra and calibration set, full cross-validation tests were treated and correlated with the hardness results by using the Unscrambler® 9.8 from Camo (Trondheim, Norway). The influence of various spectral pre-treatments [Savitzky Golay Smoothing, multiplicative scatter correction (MSC), first derivative (D1), second derivative (D2) separately and combined] and regression methods (PLS and PCR) on prediction error are compared.

Results and Discussion:

The results of NIR hardness prediction were at least as precise as the laboratory hardness test (RMSEP = 1.17).

Conclusion:

Theses results indicating that the NIR diffuse reflectance spectroscopy method is an alternative, nondestructive tool for measurement of hardness from tablets. This work a viable and non-destructive alternative to hardness testing of tablets.

Novelty statement:

The hardness in tablets for tuberculosis using NIR and multivariate calibration methods were studied. The chemometric models developed for this application showed high correlation values and low RMSEP.

Summary:

This work was investigated the potential of NIR technique to determine the hardness testing in tablets containing four active ingredients (isoniazid, rifampicin, ethambutol, pyrazinamide) using multivariate models and comparison with the conventional method.