IDENTIFICATION AND CLASSIFICATION OF OUT OF CONTROL MEASUREMENTS OF A NIR SPECTROMETER UNDER INDUSTRIAL USE FOR ONION QUALITY DETERMINATION

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ABSTRACT The use of NIR spectrometry for determination of internal quality in fruits and vegetables is widely accepted even in real time applications. Still there exist a high number of variables that are not controlled that modify the spectral information and reduce the precision of the measurements. Some of these variables are: the inner temperature of the product and of the spectrometer, the thickness of the skin and the presence of caps or hollows that act as barrier inside the product. This study validates an unsupervised procedure for the identification of abnormal observations for an on-line NIR spectrometer under industrial use for onion quality determination. Pre-processing methods combined with process control statistics are used for a multivariate supervision of the onion bulb classification under a breeding strategy during five seasons (2004-2008). Since interactions are used in real time detection of abnormal spectra and this helps avoid classification errors that originate from poor contact between a bifurcated fibber and the bulbs, as well as by equipment glitches which eventually occur due to the aggressiveness of the environment. The LPF-TAG developed a model for soluble solid prediction in onion for dehydration based in the NIR spectrum (894 - 1650 nm), which was validated during 2002. The combination of the algorithms of the pre-processed spectra allows the elimination of a part of the interference variance, increasing the number of individuals inside the limits of control for the statistics used (Q and T2 of Hotelling). The evolution of these parameters of control along the different campaigns, have allowed the classification of different spectres and the identification of interference sources that cause them, this will allow a more efficient implementation of new systems of diagnosis and control.

Keywords: Robustness analysis, NIR spectrometry, onion, classification.