

Title Nondestructive measurement of fruit and vegetable quality by means of NIR spectroscopy: A review

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Abstract

An overview is given of near infrared (NIR) spectroscopy for use in measuring quality attributes of horticultural produce. Different spectrophotometer designs and measurement principles are compared, and novel techniques, such as time and spatially resolved spectroscopy for the estimation of light absorption and scattering properties of vegetable tissue, as well as NIR multi- and hyperspectral imaging techniques are reviewed. Special attention is paid to recent developments in portable systems. Chemometrics is an essential part of NIR spectroscopy, and the available preprocessing and regression techniques, including nonlinear ones, such as kernel-based methods, are discussed. Robustness issues due to orchard and species effects and fluctuating temperatures are addressed. The problem of calibration transfer from one spectrophotometer to another is introduced, as well as techniques for calibration transfer. Most applications of NIR spectroscopy have focussed on the nondestructive measurement of soluble solids content of fruit where typically a root mean square error of prediction of 1° Brix can be achieved, but also other applications involving texture, dry matter, acidity or disorders of fruit and vegetables have been reported. Areas where more research is required are identified.