Fluorescence spectroscopy as non-destructive test to predict quality change of fresh-cut apples

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Fluorescence spectroscopy is a non-destructive analytical technique that can be used to quantify food quality changes as function of process or storage condition. Therefore, the aim of this work was to evaluate if fluorescence spectroscopy can be used as rapid test to evaluate and predict quality change of fresh-cut apples during storage. To this end, the specific objectives of the work were: to correlate fluorescence excitation emission matrix with chemical-physical properties of fresh-cut apples and to use a kinetic model approach to describe the factorial components, color, and nutritional quality indicators as function of time and temperature. Thus, fresh-cut apples were stored for 16 days at 4°C, 10°C and 15°C and at different storage times the color (L*, a*, b* and ?E), the content of vitamin C and fluorescence spectra were evaluated. PARAFAC analysis has been conducted on the fluorescence spectra and was validated for five different components, each associated with specific fluorescence regions. Quality indicators were analyzed by nonlinear regression analysis to estimate kinetic constant and Activation Energy (Ea). Results showed that the ratio between component 1 and component 2 (C1/C2) was high related to quality changes of fresh-cut apples during storage. Pseudo-first order kinetic model and Arrhenius equation well described the evolution on fresh cut apple colour, vitamin C and fluorescence parameters as function of time and storage temperature. The value of kinetic constant of C1/C2 quality index parameter (0.40 day-1) was higher than colour or vitamin C constant (0.12, 0.13 day -1). However, Ea of florescence quality index was of the same order of magnitude of colour quality index (DE) ones, respectively 86±3 kJ/mol and 76±4 kJ/mol. Whereas, Ea of vitamin C degradation showed a lower value of 16±2 kJ /mol. In conclusion, the fluorescence analysis can be used as non-destructive test to study quality changes of fresh cut apples. The spectra can be used to predict fastest quality changes in the products. However, further studies are needed to further correlate spectra and to define the critical level of acceptability to properly predict the product shelf life.