

Title Monitoring post-harvest orange fruit disease by fluorescence and reflectance hyperspectral imaging

Author M. Sighicelli, F. Colao, A. Lai and S. Patsaeva

Citation ISHS Acta Horticulturae 817:277-284. 2009.

Keyword hyperspectral imaging spectrometry; citrus fruit; post-harvest; plant pigments; quality

Abstract

The content of pigments such as chlorophylls, carotenoids and anthocyanins determines fruit colour and its appearance. These pigments are strictly related to the physiological conditions and their variation can give information about health of fruit. The application of Laser Induced Fluorescence (LIF) and reflectance imaging spectroscopy for visualisation of the pigments distribution over the fruit surface is described. The hyperspectral measurements were performed on healthy orange fruit and fruit inoculated by *Phytophthora citrophthora* (2×10^4 sporangia/ml) and *Penicillium italicum* (2×10^6 spores/ml) two important post-harvest pathogens. The Nd:YAG laser fluorometer (λ_{exc} 355 nm) capable of imaging operation was utilized to measure LIF spectra of whole fruits. Reflectance 2D spectral imaging was carried out on the same fruit using the spectral scanner ImSpector (400-1,000 nm). Both LIF and Reflectance images already 24h after inoculation showed disease development in terms of surface pigment spectra variation. In particular the spectral changes were dominated by the emission in the blue region around at 540 nm and in the red region at 680 nm. The increase of absorption (decrease of reflectance) obtained at 540 nm for *P. citrophthora* inoculation highlighted the accumulation of phenolic compounds in early response of stress Chlorophyll content decreases in each inoculated fruit according to reflectance and fluorescence emission (680 nm). The results indicate the feasibility of non-destructive assessment of pigment variation, in particular the concentration of chlorophyll and the phenolic compound changes in early response to pathogen interaction. The potential of quantitative in vivo measurements of plant pigments and phenolic compounds on orange fruit surface is also discussed.