

Citrus Fruits Quality Monitoring During Growth and Storage Period Using Fluorescence Spectroscopy

By

MUHARFIZA

Thesis Abstract:

Citrus, a fruit famous throughout Japan, is represented by Unshiu and Iyokan. To meet high quality requirements, farmers are seeking rapid, easy and fast assurance of quality; fluorescence spectroscopy is one such current technology that could provide this. The objectives of this study were to investigate ripening and maturity indices based on fluorescence signatures. In addition, changes in these fluorescence compounds during postharvest treatment were also investigated in relation to relative humidity (RH) and artificial light exposure conditions. Our results indicated three suspected fluorescence compounds (chlorophyll, polymethoxylated flavones (PMFs), and tryptophan-like) in Unshiu during fruit growth. Further analysis revealed the logarithmic ratio between tryptophan-like compound and chlorophyll with soluble solid (SS)/acid ratio were significantly correlated ($R^2 = 0.95$), as well as between the log of the ratio of PMFs with SS/acid ratio ($R^2 = 0.82$). Iyokan has two suspected fluorescence compounds (PMFs and tryptophan-like) during the postharvest treatment period. The correlation between the log of tryptophan-like compound with SS had a R^2 of 0.68; the log of the ratio between PMFs with acidity ($R^2 = 0.55$); the PMFs ratio with SS/acid ratio ($R^2 = 0.69$); and the inverse logarithmic ratio of PMFs with SS/acid ratio ($R^2 = 0.74$). Other results indicated PMFs are more responsive to light exposure than to RH, while tryptophan had no such trend. Furthermore, the SS/acid ratio was not influenced by light, but it was improved in high RH conditions. We conclude, this technology has the potential to be used for monitoring of citrus fruit quality during growth and postharvest treatment. These findings can contribute to the development of fluorescence imaging technology and proximal sensors.

Keywords: Citrus Growth; Fluorescence Spectroscopy; Polymethoxylated flavones; Tryptophan-like; Storage Period; UV-light; Soluble solids/acid ratio