The Development and Potential of Laser-Induced Light Backscattering Imaging (LLBI) for Detection of Fruit Quality

Adebayo Segun Emmanuel, Norhashila Hashim[*], Khalina Abdan

Department of Biological and Agricultural Engineering, Faculty of Engineering,
Universiti Putra Malaysia, Malaysia
E-mail address: norhashila@upm.edu.my

Marsyita Hanafi

Department of Computer and Communication Engineering, Faculty of Engineering,
Universiti Putra Malaysia, Malaysia

Abstract

The drive towards non-invasive fruit quality determination has led to the use of computer vision in the agro-food community. This paper presents an overview of the development and application of laser-induced light backscattering imaging (LLBI) for assessment of fruit quality. The fruit quality assessment covers internal quality such as soluble solids content (SSC), titratable acidity (TA) and moisture content as well as the external appearance such as colour and firmness. The capability of the system to detect external defects such as rot and chilling injury has also been reviewed. The LLBI system has proved to be a non-invasive, fast and economical method to detect fruit quality.

Keywords: Diffuse reflectance, Non-invasive, Optical properties, Fruit quality, Scattering

1. Introduction

Quality has been defined as the degree of excellence of a product or its suitability for a particular use (Abbott, 1999). Quality from the human perspective comprises many properties or characteristics. The quality of produce encompasses sensory attributes, nutritive values, chemical constituents, mechanical properties, functional properties and defects (Abbott, 1999). The assessment of the quality parameters of fruit is necessary so as to establish the best postharvest treatment, the storage temperature, right time of consumption and the optimal harvest date. Quality parameters change rapidly from an unripe to a ripe stage. Depending on the fruit variety, if harvesting is done too early the fruits will not ripen properly and this results in poor quality at the point of consumption (Crisosto, 1999; Moras, 1995).

The use of machine vision systems can be considered as a possible alternative to human inspection for automatically detecting fruit quality. In this sense, vision systems based on colour cameras has been widely used in the fruit and vegetable industries for the determination of quality (Blasco et al., 2007).