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## Monitoring of Ripening Processes in Mango Fruits using Laser Backscattering: An Innovative Optical Technique

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### Abstract

Thailand is the most important mango (*Mangifera indica* L.) producer in Southeast Asia. Demands for non-destructive techniques for mango quality prediction have been increasing with an expansion of overseas markets supported by several export promotion programs. Laser light backscattering measurements based on photon absorption and light scattering properties of materials have been increasingly studied for the application in the food industry. In this work, the possibility to use laser light backscattering for monitoring of mango quality during ripening was studied regarding. The potential to predict physiochemical parameters of the fruit such as total soluble solid (TSS), individual sugar content, starch content, dry matter content (DM), texture and peel and flesh colour was evaluated during ripening experiments with Thai mangos. Images of the laser light backscattering on the fruit surface were obtained from fruits using laser diodes irradiating at four wavelengths. The laser backscattering was captured by a CCD camera as a monochrome image. The captured images were then analysed to create intensity profile to derive backscattering properties in pixel number to compare the fruit qualities measured by conventional destructive methods. Differences in backscattering behaviours were found during different ripening stages due to changes in photon absorption and reflection of tested wavelengths corresponding to chemical compounds of the fruits. Laser images at 635 nm showed less photon migration in later stages of ripening which resulted in the increase of scattering due to the changes in the fruit compounds. The results from the study show the potential use of laser backscattering for the prediction of mango quality during ripening. Further development and improvement of the technique regarding the image acquisition and the determination of sensitive wavelength corresponding to certain chemical components of the fruit are required.

**Keywords:** Laser backscattering, mango, non-destructive analysis, ripening