P6-26

Application of time-of-flight near infrared spectroscopy to Satsuma mandarin

SATORU TSUCHIKAWA*[1], SATOMI ITO[1], KINUYO INOUE[1], and KUMI MIYAMOTO[2]

[1] *Graduate School of Bioagricultural Sciences, Nagoya University, Nagoya 464-8601, Japan*

[2] *Wakayama Fruit Tree Experiment Station, Kibi, Wakayama 643-0022, Japan*

In this study, a newly constructed optical measurement system, whose main components were a parametric tunable laser and a near infrared photoelectric multiplier, was applied to detection of the information for the inside of Satsuma mandarin using time-of-flight near infrared spectroscopy (TOF-NIRS). The combined effects on the time resolved profile of sample diameter, sugar content, the wavelength of the laser beam, and the detection position of transmitted light were investigated in detail. The samples used were Satsuma mandarin (*Citrus unshu* Marc.) (location: Wakayama, Japan) having the diameters of 50-84 mm. The sugar content measured by a refractometer varied from 9.9 to 16.3 Brix %. Equator of sample was irradiated vertically with the pulsed laser, and transmitted output power was measured on the restricted position of the equator using the optical fiber cable. The sampling time and the number of averaging the output power were 100 ns and 100 times, respectively.

The variation of the attenuance of peak maxima At, the time delay of peak maxima Δt and the variation of full width at half maximum Δw were strongly dependent on the detection position and the wavelength of the laser beam. At, Δt and Δw increased gradually as the sample diameter increased to be much absorbed and vigorously scattered. On the other hand, each optical parameter had a tendency to increase as the sugar content increased. Such behavior was remarkable when the transmitted light was detected at the side face of a sample. When we apply TOF-NIRS to detection of the information for the inside of fruit with high moisture content like Satsuma mandarin, it is very important to give attention to the difference in the scattered light within tissues and the semi-straightly propagated light. Furthermore, we tried to express the resulting phenomena by using a model samples composed of water, sucrose, and milk. The variation of the time resolved profile is strongly governed by the combination of the light absorption component, scattering medium, and refractive index.