Abstract:

Nitrate content in vegetables is concerned with food safety. But a non-destructive nitrate determination method in food has not been reported yet. To measure the VIS-NIR absorption spectrum, each Japanese radish was hand placed on, or 3 mm apart from, the end of the fibre optic probe (the former is ‘contact mode’, the latter is ‘non-contact mode’.) (Ito et al., 2000) so that the radish was centred. The original spectra were converted to the second derivative spectra (d2 log 1/R). Following optical measurement, a piece of tissue was cut out from the irradiated area of radish. To obtain its juice, the tissue was comminuted with a grater and centrifuged. Nitrate concentration of the juice was determined using a colourimetric method. Multiple linear regression (MLR) on spectra (n=24) of non-contact mode gave a calibration equation using d2 log 1/R at 560, 902, 864 and 904 nm with a multiple correlation coefficient (MR) of 0.929, and a standard error of the calibration sample set (SEC) of 675 ppm. MLR on spectra of contact mode gave a calibration equation using d2 log 1/R at 560, 902, 884 and 864 nm with a MR of 0.927, and a SEC of 686 ppm. Then the single correlation coefficients between d2 log 1/R at 560 nm and nitrate concentration were high (R= -0.888 for contact mode, -0.858 for non-contact mode, respectively). When the results for non-contact mode and contact mode were compared in validation sample sets, the former mode improved the latter RMS (root mean square of the differences between laboratory-determined and VIS-NIR-calculated nitrate concentration). We conclude that VIS-NIR technology offers potential of non-destructive nitrate determination in vegetables.