

Application of Near Infrared Spectroscopy for Nondestructive Evaluation of Nitrogen Content in Ginseng

Guo-lin Lin*, Mi-Ryeong Sohn, Eun-Ok Kim, Young-Kil Kwon and Rae-Kwang Cho

Dept. of Agricultural Chemistry, Kyungpook National University, Taegu, 702-701, Korea

Ginseng cultivated in different country or growing condition has generally different components such as saponin and protein, and it relates to efficacy and action. Protein content assumes by nitrogen content in ginseng radix. Nitrogen content could be determined by chemical analysis such as kjeldahl or extraction methods. However, these methods require long analysis time and result in environmental pollution and sample damage. In this work we investigated the possibility of non-destructive determination of nitrogen content in ginseng radix using near-infrared spectroscopy.

Ginseng radix, root of *Panax ginseng* C. A. Meyer, was studied. Total 120 samples were used in this study and it consisted of 6 sample sets, 4, 5 and 6-year-old Korea ginseng and 7, 8 and 9-year-old China ginseng, respectively. Each sample set has 20 samples. Nitrogen content was measured by electronic analysis. NIR reflectance spectra were collected over the 1100 to 2500 nm spectral region with an InfraAlyzer 500C

(Bran+Luebbe, Germany) equipped with a halogen lamp and PbS detector and data were collected every 2 nm data point intervals. The calibration models were carried out by multiple linear regression (MLR) and partial least squares (PLS) analysis using IDAS and SESAME software.

Results of electronic analysis, Korean ginseng were different mean values in nitrogen content of China ginseng. Ginseng tends to generally decrease the nitrogen content according to the cultivation year, which is over 6 years. The MLR calibration model with 8 wavelengths using IDAS software accurately predicted nitrogen contents with a correlation coefficient (R) and standard error of prediction of 0.985 and 0.855%, respectively. In the case of SESAME software, the MLR calibration with 9 wavelengths was selected as the best calibration, with R and SEP values of 0.972 and 0.596%, respectively. The PLSR calibration model resulted in 0.969 of R and 0.630 of RMSEP. This study shows that NIR spectroscopy could be applied to determine the nitrogen content in ginseng radix with high accuracy.