



E77 Discrimination of Ginseng Cultivation Regions With Stable Isotope Ratio and Multi-Element Analyses

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After attending this presentation, attendees will better understand pretreatment methods for analyzing soil and ginseng, as well as the correlation of the stable isotope ratio between ginseng and soil. In addition, attendees will learn about the influence of the elemental composition of the soil on the composition of ginseng.

This presentation will impact the forensic science community by explaining how the importance of hydrogen and nitrogen isotope ratios can be used to discriminate the regional origin and elements in soil, and how Discriminant Function Analysis (DFA) is a good tool for forensic analysis.

Korean ginseng is considered to be a precious health food in Asia. Because of this usefulness, criminal acts, including the origin or stealing of ginsengs are rampant. Therefore, this study to investigate the regional origin of ginsengs was required. In this study, two different types of samples were prepared: ginseng and soil from the periphery of ginseng farms. Ginseng and soil samples were collected by the following method. Several regions were selected on the basis of Korean regional criteria (city, county, and district), and two ginseng farms were randomly selected from each of the regions. Next, four to six samples of ginseng and soil were acquired from each ginseng farm. Measurements were then performed in two different ways: (1) the stable isotopic composition of hydrogen, oxygen, carbon, and nitrogen were obtained using Elemental Analyzer/Isotope Ratio Mass Spectrometer (EA/IRMS); and, (2) multi-element analysis was conducted with an X-Ray Fluorescence (XRF) spectrometer. According to the isotope ratio analysis results, hydrogen, oxygen, carbon, and nitrogen isotope ratio values were between -69.16‰ and -30.59‰, 28.11‰ and 41.38‰, -28.96‰ and -22.67‰, and -2.33‰ and 11.81‰, respectively. The hydrogen isotope ratios could be used to distinguish large regional differences (e.g., inland or coastal areas might be divided) by an independent sample *T*-test and the nitrogen isotope ratios showed characteristic information regarding the farms from which the samples were obtained, again using an independent sample *T*-test. In addition, multi-element analysis, based on Discriminant Function Analysis (DFA), showed a successful classification is possible for each region. Furthermore, correlations of stable isotope ratio (carbon and nitrogen) and element quantity are found between ginseng and soil data. Thus, stable isotope ratio values and multi-element analysis could be used to differentiate samples according to regional differences. Therefore, stable isotope (hydrogen, nitrogen) ratios and multi-element analysis may be a useful tool to discriminate the regional origin of Korean ginseng.

Ginseng, Stable Isotope Ratio, Multi-Element Analysis