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Geographic authentication of rice (*Oryza sativa* L.) collected from Asian countries using multi-elements, stable isotope ratio, and chemometric analyses

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Abstract

Rice (*Oryza sativa* L.) is the world's third largest food crop after wheat and corn. Geographic authentication of rice has recently emerged as an important issue for enhancing human health via food safety and quality assurance. Here, we aimed to discriminate rice from six Asian countries through geographic authentication using combinations of elemental/isotopic composition analysis and chemometric techniques. Principal components analysis could distinguish samples cultivated from most countries, except for those cultivated in the Philippines and Japan. Furthermore, orthogonal projection to latent structure-discriminant analysis provided clear discrimination between rice cultivated in Korea and other countries. The major common variables responsible for differentiation in these models were $\delta^{34}\text{S}$, Mn, and Mg. Our findings contribute to understanding the variations in elemental and isotopic compositions in rice depending on geographic origins, and offer valuable insight into the control of fraudulent labeling regarding the geographic origins of rice traded among Asian countries.

Keywords: rice, geographic origin, stable isotope ratios, elements, chemometrics

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