

Usefulness of strontium isotope composition for determining the geographical origin of wasabi and potato

*Takafumi Kamitani¹, Ki-Cheol Shin², Sachiko Nakamura¹, Rika Koda¹, Tomoya Oka¹, Noriaki Fushimi¹, Yasuhide Muranaka¹

1. Shizuoka Institute of Environment and Hygiene, 2. Research Institute for Humanity and Nature

Originally, the use of strontium isotope ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) was restricted to geology and petrology, but they have been used as a particularly effective tracer of geographical food origin, as plants reflect the strontium isotope composition of the regionally based rock, soil, and water. This study aims to evaluate the usefulness of $^{87}\text{Sr}/^{86}\text{Sr}$ for determining the geographical origin of wasabi (Japanese horseradish) and potato, which are specialty crops in Shizuoka Prefecture, Japan.

Wasabi is cultivated in springs and streams located at the top of rivers, where dissolved element and isotopic compositions in water would reflect the geological characteristics without the effects of atmospheric deposition and human activity. We collected wasabi and water samples from 40 locations of major production areas in Japan: Shizuoka, Iwate, Nagano, Tokyo, and Shimane. These samples were subjected to trace elements and $^{87}\text{Sr}/^{86}\text{Sr}$ analyses. The $^{87}\text{Sr}/^{86}\text{Sr}$ values differed, based on the geological characteristics of their site locations, and the value of wasabi was well accorded with that of water in the same location. The wasabi samples collected from Izu Peninsula and Mt. Fuji regions in Shizuoka, where young volcanic rocks such as Quaternary basalts are distributed, had low $^{87}\text{Sr}/^{86}\text{Sr}$ (below 0.7040), whereas those from Nagano and Tokyo, where older rocks such as Mesozoic granites and accretionary complex are distributed, showed higher ratios (over 0.7095). We conclude that $^{87}\text{Sr}/^{86}\text{Sr}$ value of wasabi allowed us to distinguish the production area clearly.

On the other hand, the $^{87}\text{Sr}/^{86}\text{Sr}$ values of crops cultivated in the field are considered to be partly affected by precipitation and fertilizer. Therefore we conducted field survey and planter test for potato in Shizuoka. Field survey was conducted at Mishima, in eastern part of Shizuoka prefecture, and at Mikatahara, in western part of it, and $^{87}\text{Sr}/^{86}\text{Sr}$ of potato and soil exchangeable fraction were compared. As a result, there was a correlation between potato and soil in $^{87}\text{Sr}/^{86}\text{Sr}$, although the effects of precipitation and fertilizer were observed. The planter test suggests that the influence of fertilizer on $^{87}\text{Sr}/^{86}\text{Sr}$ varies depending on the amount of exchangeable Sr contained in the original soil.

Keywords: geographical origin, strontium isotope ratio, wasabi, potato, Shizuoka