

**Method development for identification of geographical origin of
Japanese apples by PIXE analysis
-Characteristic of elements in soils from apple producing regions-**

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Abstract

We studied characteristic of elements in soil samples from apple producing regions to develop method for identification of geographical origin of Japanese apples by PIXE analysis. Soils of Japanese 'Fuji' apples were examined in this study. Sampling sites were selected from Kazuno and Yokote city that were apple producing regions in Akita Pref. in Japan. Soil samples were collected from upper (0-20 cm) and lower (20-40 cm) layers in their sites. Twenty four elements were respectively determined from Kazuno and Yokote samples. The following elements were respectively determined from Kazuno and Yokote samples: "Na, Mg, Al, Si, K, Ca, Ti, V, Fe, Cl, Cr, Mn, Cu, Zn, Ga, As, Br, Rb, Sr, Y, Zr, Nb, Pb"; "Na, Mg, Al, Si, K, Ca, Ti, Fe, Cl, Cr, Mn, Cu, Zn, Ga, As, Br, Rb, Sr, Zr, Nb, Mo, Ba, Pb". Both soil samples in Kazuno and Yokote were rich in "Na, Mg, Al, Si, K, Ca, Ti, Fe". Concentration ranges of those elements were three orders of magnitude higher than those of other elements ($\geq 1000 \mu\text{g/g-dry}$). Soil samples in Kazuno were poor in "S, Cl, V, Cr, Mn, Cu, Zn, Ga, As, Br, Rb, Sr, Y, Zr, Nb, Pb". Regarding soil samples in Yokote, they were poor in "S, Cl, Cr, Mn, Cu, Zn, Ga, As, Br, Rb, Sr, Zr, Nb, Mo, Ba, Pb". Concentration ranges of those elements were three orders of magnitude lower than those of other elements ($< 1000 \mu\text{g/g-dry}$). "V and Y" and "Mo and Ba" were respectively determined from Kazuno and Yokote samples alone.