Method development for identification of geographical origin of Japanese apples by PIXE analysis - Characteristics of element compositions in seeds, peduncles, and soils from apple producing regions

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Abstract

We studied characteristics of element in seeds, peduncles, and soils from apple producing regions to develop method for identification of geographical origin of Japanese apples by PIXE analysis. Seeds and peduncles from apple fruits of Japanese 'Fuji' apples were examined in this study. Apple fruits for this study were collected from Kazuno and Yokote cities that were apple producing regions in Akita Pref. in Japan. Concentration ranges of seeds and peduncles in apple fruits were 10^{-1} to 10^{4}. Concentration levels of elements in soils from kazuno and yokote were clearly contributed to those in seeds and peduncles. Element compositions and their concentration levels of soils and those of seeds and peduncles in apple fruits resembled each other. The following elements were respectively determined from seeds and peduncles in both or either Kazuno and Yokote samples: “Na, Mg, Al, Si, K, Ca, Ti, Cr, Mn, Fe, Cu, Zn, As, Se, Br, Rb, Sr”; “Na, Mg, Al, Si, K, Ca, Ti, Cr, Mn, Fe, Cu, Zn, As, Se, Br, Rb, Sr, Ba, Hg”. Both samples in Kazuno and Yokote were rich in “Mg, P, S, K, Ca” (>=1000 μg/g-dry). Other element concentrations were lower than those elements. Except for exceptions, those elements concentrations in seeds were clearly higher than those in peduncles. Relative standard deviations of Na, Mg, Al, Si, Ti, Cr, Rb for seeds and those of Na, Mg, Al, Si, P, Ti, Cr, Mn, Ni, Cu, Zn, Sr for peduncles were much higher than those in other elements (>20%). We conclude that Cr, Ni, Rb and Sr could be contributed to identification of geographical origin of Japanese apples by PIXE analysis.