Application of PIXE analysis to studies on uptake of alkali elements in mushrooms

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Abstract

In this work we aimed to compare accumulation of alkali elements and radioactive cesium in radio-contaminated mushrooms cultivated with stable cesium and rubidium, and to reveal a correlation between them using particle-induced X-ray emission (PIXE). Shiitake mushrooms were cultivated at Tohoku University with radio-contaminated hardwood logs used for shiitake cultivation in Iitate Village. Before shiitake mushroom cultivation, aqueous solutions of stable cesium carbonate and rubidium carbonate were sprayed onto the logs to evaluate concentration of alkali elements in shiitake mushrooms using PIXE analysis. In order to measure spatial distribution of radioactivity in the shiitake mushroom, an autoradiographic method was employed. We cut the raw mushroom samples and attached their cutting surface on an imaging plate (Fuji film Co., Ltd.). Radioactive determination of the samples was also performed using a high-purity Ge detector. The results showed that radioactive cesium was not uniformly distributed in shiitake and strongly accumulated in the peripheral region of pileus of shiitake. The results of PIXE analysis showed that both cesium and rubidium were strongly accumulated in the peripheral region of pileus compared to other portions of shiitake, suggesting that shiitake accumulates radioactive cesium by the same mechanism as other alkali elements such as rubidium.