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Radio-cesium accumulation during decomposition of leaf litter in a deciduous forest after the Fukushima NPP accident.

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Fukusima NPP accident contaminated vast area in eastern Japan with radio isotopes. Most of the area is covered by natural and plantation forest. The forest floor in deciduous forests, and canopy of evergreen forest were most contaminated by fall out. Radio-cesium is known to stay bioavailable in forest ecosystems for long time, and it is necessary to cut the cycling process to decontaminate the forest ecosystem. Ecological process to recycle radio-Cs in forest ecosystem should be studied to enhance decontamination of radio-Cs. Mushrooms show high concentration of Cs. Although mushroom biomass in a forest ecosystem is small, fungal mycelium in detritus and soil is large, thus fungi contain substantial amount of radio-Cs. It is well known that concentration of some nutrients, such as nitrogen and phosphorus, increase, whereas potassium decreases during the leaf litter decomposition. We observed radio-Cs concentration of leaf litter during decomposition on a forest floor where 134-Cs and 137-Cs of surface soil were 5,700, and 6,800 Bq/kg, respectively. We put 16 g (dry weight) of newly fallen mixed deciduous leaf litter (half of which was oak, Quercus serrata) into 25 cm x 25 cm litter bag (2 mm mesh size) in a deciduous forest about 50 km from Fukushima NPP. Fresh litter 137-Cs concentration was ca. 1,000 Bq/kg in December 2011. During the decomposition process on the forest floor, litter Cs increased exponentially and exceeded 10,000 Bq/kg after 6 months, indicating that Cs and K show contrasting dynamics during early decomposition phase. Increase in fungal biomass in the early stage of litter decomposition was observed. Therefore, this upward movement of Cs from humus and soil layer suggests fungal translocation of nutrients from outside of litter substrate. Retrieving the litter after 6 months can remove 18.0% of 134-Cs. Interaction between fungal species, grazing effect on fungi by fungivorous invertebrates will change the amount of translocation of radio-Cs from soil to decomposing litter.