Local distributions of radioactive Cs deposited on plant and soil from Fukushima Daiichi Nuclear Power Plants

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After the accident of Fukushima Daiichi Nuclear Power Plant (FDNPP), the fallout radioactive Cs were dispersed from FDNPP to ocean [1,2] and land [1]. Some of the released radioactive Cs was deposited on the ground of the area located north-west direction from FDNPP. The spatial concentration distribution and depth profiles of radioactive Cs were measured to estimate dose rate and to estimate the fate in the terrestrial environment.

For the estimation of migration of radioactive Cs, chemical states of the deposited radioactive Cs should be clarified. We first sampled the soils, plants, and paddy area at Iitate-mura, Fukushima on June, 2011 to estimate the chemical states of radioactive Cs deposited [3]. We have measured local distribution on/in trees, plants, and surface soil beneath the plants using autoradiography analysis.

The trees sampled were *Cryptomeria japonica*, *Torreya nucifera*, and *Prunus mume*. The grass at meadow area and rice (*Orysa sative*) stubble at paddy area were collected with soil attached around roots. The local distribution of radioactive Cs was measured by autoradiography technique using Bioimaging analyzer of BAS2500 (Fuji Film, Japan). The samples were not pretreated for the autoradiography analysis. The shape and color of the samples were recorded by optical photograph.

The autoradiography images of *Torreya nucifera* is shown in Fig. 1 along with optical photograph. The black points in the autoradiograph image showed the area of radioactive Cs was accumulated. The black spots sized about 2 mm were distributed on the branch and leaves of *Torreya nucifera*, indicating that radioactive Cs was distributed heterogeneously on the branch and leaves of trees. The area of red circles in Fig. 1 showed no black spot on the branch and the leaves. The optical photograph showed that the color of the leaves in the red circles sickly green. This indicates that the branch and leaves in the red circles were grown in this year probably after the FDNPP accident. These results suggest that only small fraction of deposited Cs may be transported to new branch and leaves grown after the accident. Little fraction of the deposited radioactive Cs was transported from the grown branch and leaves to new born ones. Similar results were obtained for *Cryptomeria japonica* and *Prunus mume*. By the treatment of the branch and leaves with a 1 M CH_3COOH solution showed approximately 5% of the radioactive Cs was dissolved from the branch and leaves into the acetic acid solution, indicating that radioactive Cs was tightly associated with the branch and leaves.

The autoradiograph image of grass at the meadow (Fig. 2) indicated the black spots were distributed on the grass above the ground level (yellow dashed line), but not with soil root beneath the ground level (red circles). The black spots on the stubble of rice showed similar distribution. These results indicated that the radioactive Cs was deposited on the grass and the rice plant. In addition, the ratio of the radioactive Cs penetrated into soil layer by weathering was very small for two months after accident. These results indicate that trees and plant would be the reservoir of the fallout Cs and function for retardation of the fallout Cs migration with rain water.

Fig. 1 Autoradiograph image (a) and optical photograph (b) of *Torreya nucifera* sampled at Iitate, Fukushima, about 30 km from FDNPP.

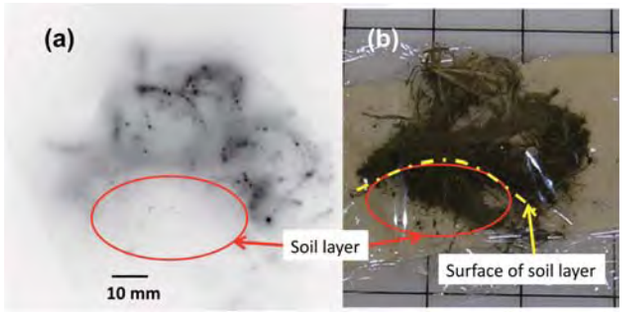

Fig. 2 Autoradiograph image (a) and optical photograph (b) of cross section of meadow grass with soil beneath the grass.

References

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