

Dynamic of radiocesium from conifer needles to male flowers of sugi

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A large amount of radioactive substances were released into air through the severe accident of Fukushima Daiichi Nuclear Power Plant (NPP) in March 2011. They deposited on forest environments and absorbed and transported in trees, so they were detected in leaves developed even after 2012, when the release of radioactive substances from Fukushima Daiichi NPP should be stopped. In the spring of 2012, radioactive substances including radiocesium were detected in pollen of sugi (*Cryptomeria japonica*) in Fukushima. Since a large quantity of sugi pollen dispersing in spring has been recorded in Japan, it is considered that the secondary radioactive dispersion might be occurred through pollen. In order to estimate the secondary dispersion of radiocesium from sugi forests, it is important to understand the transfer of radiocesium from needle leaves to pollen through male flowers. We measured the radiocesium concentrations in sugi needle leaves, male flowers, and pollen, and then evaluated the transport characteristics.

Sugi needles with male flowers were collected from 114 sites in Tohoku, Kanto and Koshinetsu districts from November to December 2012. Three samples (one sample from one individual) were collected at one site. Male flowers were collected from the samples and the needles were separated into three different parts corresponding to each elongation year; 2012, 2011, and before 2010. They were washed with tap water and rinsed with distilled water, and then oven-dried at 80°C for 48 hours. They were enclosed into U-type containers without pulverization for male flowers and with pulverization for needles. By gamma ray spectrometry using High purity germanium (HPGe) radiation detector, cesium 137 and 134 (Cs-137, 134) were detected, and the radioactivity per dry weight (Bq/kg) were calculated. Gamma ray spectrometry of the pollen samples were conducted by using a well type of HPGe radiation detector. The distribution of radioactive substances in needles and male flowers were detected by an autoradiography method of Imaging Plate (IP).

Needles at the part of before 2010 resulted in the highest concentrations of Cs-137, 134 compared with other parts. Autoradiograph images showed spotted distribution of high radioactivity. Therefore, it is considered that the radioactive fallouts from Fukushima Daiichi NPP accident attached and remained on sugi needles without washout. Male flowers showed higher radiocesium concentrations than needles elongated in 2012, and the top of needles, which sustained male flowers, also contained higher concentrations of radioactivity than the other part of needles elongated in 2012. These results suggested that radiocesium is easy to transport to the needle top including male flowers.

Keywords: Fukushima Daiichi Nuclear Power Plant accident, sugi, needle, male flower, Cs-137, Cs-134