

# Transfer of Iodine and Cesium from the Surface of Leaf, Trunk or Fruit to the Interior of Apple Fruit

Hitoshi KAWABATA, Masumi YANAI, Yasuhiro TAKO, Yuichi TAKAKU, Shun'ichi  
HISAMATSU

*Department of Radioecology*

## Abstract

Part of the radionuclides released into the atmosphere are deposited on the surfaces of crop plants, followed by absorption and translocation to other parts of the plants. Apple fruit is one of the important agricultural products in Aomori Prefecture, where the first commercial nuclear fuel reprocessing plant is now under construction. Since the behavior of radiocesium and radioiodine deposited on apple tree surfaces and their transfer to fruit are not well known, a research project to determine them was launched in FY 2016. In FY 2017, we studied 1) the absorption of stable I<sup>-</sup> or Cs<sup>+</sup> applied onto fruit surfaces, and 2) the absorption and translocation of stable Cs<sup>+</sup> applied onto leaf or trunk surfaces. In both studies, the target ions were applied as liquid droplets on the surface. Potted Plumleaf crab apple (*Malus sp.* cv. ALPS OTOME) trees, 2 to 4 years old, were used as the experimental plant for easy handling.

We cultivated the apple trees in artificial climate chambers and applied droplets of I<sup>-</sup> or Cs<sup>+</sup> solution onto the fruit surfaces at early and late development stages and the fully mature stage, corresponding to 106, 141 and 176 days after bud breaks, respectively. The fruits were periodically collected from the trees, and their surfaces were washed with solution containing detergent, followed by peeling them. The washed solution, peel and flesh samples were analyzed for I or Cs. At all growth stages, the washable proportion of I and Cs on the fruit surface decreased in two phases, the initial phase decreased quickly and later one decreased slowly excluding Cs applied at the fully mature stage. For Cs applied at the fully mature stage, there was an early fast decrease followed by constant values. At the late fruit development stage, the proportion of both elements in peel and flesh samples rapidly increased during ~2 d followed by almost constant values being maintained; this showed the rapid transfer of both elements from the surface to inside the fruits. Recovery ratios of both elements in the whole fruits including the washable fraction to the applied load were <1.0 indicating the translocation of I and Cs to another part of the plant and/or volatilization for I.

After applying droplets of Cs<sup>+</sup> solution onto the leaf and trunk surfaces of apple trees before bearing fruit (60 to 68 d after bud breaks), the whole apple trees were periodically collected and separated into their parts. The Cs-applied leaf and trunk samples were washed with solution containing detergent, followed by analyzing the samples and the washed solution for Cs together with other plant part samples. The washable Cs from both surfaces also had two decreasing phases: the initial phase decreased quickly and the later phase decreased slowly. The translocated Cs to fruits were found to be several tenths of the percent values of the load applied to each surface.

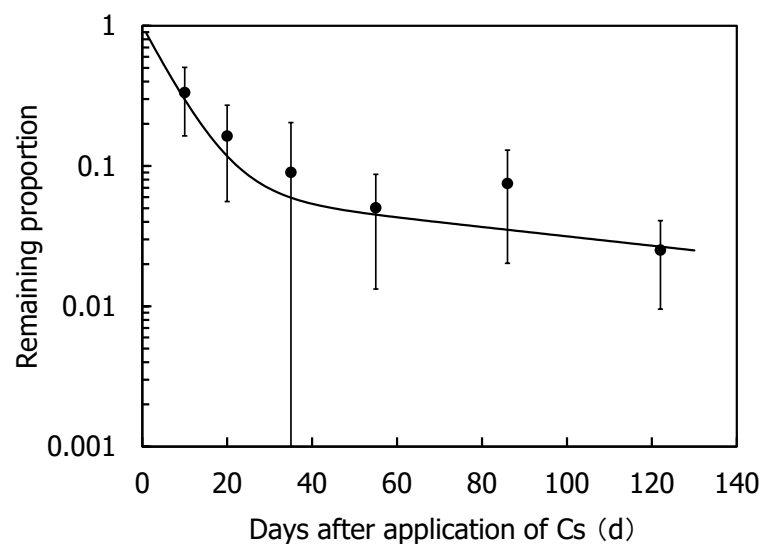


Fig. 1 Change in remaining proportion of Cs after application of Cs. Remaining proportion of Cs was defined as the ratio of the amounts on leaf surfaces to that loaded initially on the leaf surfaces.

Vertical bars indicate a standard deviation of 2 or 3 samples. The lines show least square approximation by a function with two exponential terms of days after application of Cs.