IMAGING RADIOCESIUM MOVEMENTS IN INTACT PLANTS

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Introduction

Large agricultural areas around the Fukushima Daiichi Nuclear Power Station in Japan were contaminated with radiocesium after the accident following the earthquake and tsunami in March 2011. A variety of agricultural studies, such as fertilizer management and plant breeding, have been undertaken for reduction of radiocesium uptake in crops, or, enhancement of uptake in phytoremediation. In this study, we newly developed imaging systems specific for plant nutritional research, and performed quantitative analyses on uptake and partitioning of radiocesium in intact plant bodies.

Methods

Radiotracer imaging is one of the few methods that enable the observation of the dynamics of substances in a living plant body without sampling or fixation of plant tissue. We tried to modify four types of imaging method for Cs-137 movements; gamma camera system, Cherenkov light imaging system, and Compton camera imaging system for Cs-137, and positron emitting tracer imaging system with production of positron emitting radiotracer of Cs.

Results

In this abstract, results of Cherenkov light imaging with a soybean, whose roots were dipped in 17 mL of the culture solution containing 10 MBq of Cs-137, are shown in Figure 1. High resolution images represented Cs-137 transportation from the roots to the shoot and an accumulation into the node.

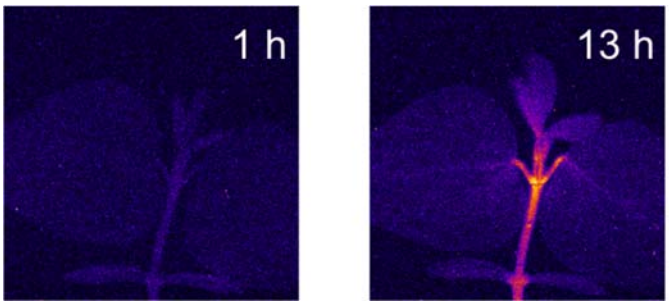

Figure 1. Two images of ^{137}Cs dynamics after dipping solution of Cs-137 1 hour (left) and 13 hours (right).

Conclusion

We have developed four imaging methods that can obtain dynamic and quantitative images of radiocesium movement in intact plants. It may provide practical measures for realizing crops/cleanup plants with low/high accumulation of radiocesium and agricultural methods to control partitioning of radiocesium within plant bodies. And, for probability risk assessments of plant research, these imaging methods are fundamental to efficiently and effectively determine the Cs kinetic.