Recently, positron-emitting nuclides have been used in plants to study the behavior of metals such as ^{52}Fe, ^{52}Mn, and ^{62}Zn using a positron-emitting tracer imaging system (PETIS) (Watanabe et al., 2001). The tracers of ^{105}Cd and ^{107}Cd which are positron-emitting nuclides have been developed and are being applied to plants for visualizing the movement of Cd in real-time (Fujimaki et al., 2006). In the present study, we used PETIS to analyze the real-time translocation of Cd in 6 rice cultivars with different Cd accumulation in upper parts including grains.

We previously selected three rice cultivars (*Oryza sativa* L., *indica* type, cvs. Cho-ko-koku, Jarjan, Anjana Dhan) with extremely high Cd concentration in grains and shoots, while three major *japonica* cultivars in Japan (Nipponbare, Koshihikari, and Sasanishiki) showed a lower Cd concentration in these parts (Uraguchi et al., 2009). Six cultivars were grown in a hydroponic culture for 20 days, and then the seedlings were transplanted to plastic syringes containing 0.5 mM $CaCl_2$ solution. PETIS analysis was started by adding purified ^{107}Cd (half-life 6.5h) with 0.1μM Cd as a carrier to 0.5 mM $CaCl_2$ solution. Time-series images of the ^{107}Cd distribution were monitored simultaneously in 6 rice cultivars.

The serial images obtained from PETIS revealed that ^{107}Cd first appeared at the basal portion of the shoot within 2h after ^{107}Cd exposure. This was similar pattern to ^{52}Mn and ^{52}Fe in barley, suggesting that this region may play an important role in heavy metal distribution in graminaceous plants (Tsukamoto et al., 2009). The strength of ^{107}Cd signal at the basal portion was much greater in *indica* cultivars than in *japonica* ones during ^{107}Cd exposure. ^{107}Cd accumulated increasingly at the upper portion of the shoot in *indica* cultivars with time, while the signal of ^{107}Cd was less in *japonica* cultivars. Thus, the positron emitter of ^{107} Cd was very useful isotope for studying the real-time behavior of Cd in rice plants and we first succeeded to visualize the difference in the real-time translocation of Cd among rice cultivars showing different shoot Cd accumulation. Taken together, these results suggest that different pattern of root-to-shoot translocation of Cd is responsible for genotypic variation in the shoot Cd concentration in rice.

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