

## W31

### Study for grain-filling of rice using $^{13}\text{C}$ labeling flow-metabolome analysis

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#### Abstract

Rice (*Oryza sativa* L.) is the most important crop and its yield must be improved to feed the increasing global population. Recently developed high-yielding varieties with extra-large sink capacity often have a problem in unstable grain-filling. Therefore, understanding limiting factors for improving grain-filling and controlling them are essential for further improvement of rice grain yield. However, since grain-filling rate was determined by complex sink-source balance, the ability of grain-filling was very difficult to evaluate. Source ability for 'grain' was not only determined by the ability of carbon assimilation in leaves, but also that of carbon translocation from leaves to panicles. Sink strength was determined by the complex carbon metabolism from sucrose degradation to starch synthesis. Hence, to evaluate the grain-filling ability and determine its regulatory steps, the whole picture of carbon flow from photosynthesis at leaves to starch synthesis at grains must be revealed in a metabolite level. In this study, the yield and grain growth rate of three high-yielding varieties, which show high sink capacity commonly, were compared. Momiroman showed lower grain filling rate and slower grain growth rate than the other varieties, Hokuriku 193 and Teqing. To clarify the limiting point in the carbon flow of Momiroman, CO<sub>2</sub> labeled by stable isotope ( $^{13}\text{C}$ ) was fed to three varieties during ripening period. The ratio of  $^{13}\text{C}$  left in the stem was higher in Momiroman 24 hours after feeding, suggesting inefficient carbon translocation of Momiroman. More interestingly,  $^{13}\text{C}$  translocation from soluble fraction to insoluble one in the grain seemed to be slower in Momiroman. To get the further insight in a metabolite level, we are now trying the  $^{13}\text{C}$  labeling metabolome analysis in the developing grains.

Keywords: rice, grain yield, sink strength, carbon translocation, stable isotope

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