[O42] Assimilate Partitioning for Crop Productivity and Quality

Chair: Naohiro Aoki (The University of Tokyo, Japan)
Chair: Tatsuro Hirose (Takasaki University of Health and Welfare, Japan)
Chair: Yong-Ling Ruan (The University of Newcastle, Australia)
Thu. Sep 9, 2021 2:30 PM - 4:30 PM Room 4 (Oral) (Crop Genetics and Physiology)

3:10 PM - 3:25 PM

[O42-03]Co-Overproduction of Rubisco and Rubisco Activase Increases the Photosynthesis Rate under High Temperature in Rice

*Nominated for Presentation Awards

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Rubisco is a rate-limiting factor for light-saturated photosynthesis at the present atmospheric air conditions. However, overproduction of Rubisco in rice did not always lead to photosynthesis improvement. This was considered to be caused by a decline in the activation state of Rubisco. In this study, we tried to improve photosynthetic capacity by co-overproducing Rubisco and Rubisco activase (RCA). For this purpose, Rubisco-overproduced rice plants were crossed with RCA-overproduced rice plants. We successfully obtained several transgenic rice lines with 1.2- to 1.5-fold increase in Rubisco content and 1.3- to 2.2-fold increase in RCA content. Under conditions of high irradiance, 25℃ and ambient CO_2 levels, while the activation state of Rubisco in Rubisco-overproduced plants was lower than in wild-type plants, that in the co-overproduced plants was enhanced to a similar level of wild-type plants. However, the light-saturated rate of CO_2 assimilation per unit of leaf area in the co-overproduced plants did not exceed that of wild-type plants even under low CO_2 conditions. On the other hand, at high temperature (36℃), the rate of CO2 assimilation in co-overproduced plants was higher than that of wild-type plants by up to 20% under ambient and lower CO_2 conditions. These results demonstrated that under high temperature conditions, where photosynthesis is strongly limited by Rubisco capacity, co-overproduction of Rubisco and Rubisco activase was effective in improving photosynthesis in rice.