

[P4] Crop Genetics and Physiology

Thu. Sep 9, 2021 12:15 PM - 2:00 PM Room 4 (Poster) (Crop Genetics and Physiology)

12:15 PM - 1:00 PM

[P4-13] Genome Wide Association Study for Leaf Photosynthetic Properties in 166 *Temperate Japonica* Rice Cultivars

*Nominated for Presentation Awards

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Intraspecific genetic variation of leaf photosynthetic capacity is a promising resource for crop improvements. Although a lot of QTL studies for leaf photosynthesis have been reported elsewhere, few attempts of genome wide association study (GWAS) have been made. This is partly due to the low efficiency of photosynthetic measurements and the influence of environmental fluctuations on photosynthesis in the field. In this study, using 166 cultivars of temperate *japonica* rice grown in the field, we conducted GWAS for leaf photosynthetic properties in our original procedure enabling multiple photosynthetic evaluations under laboratory settings. We found a wide range of difference in CO₂ assimilation rate (*A*) among the varieties by 125.6% and 85.8% in 2019 and 2020, respectively. From the combined analysis across the years to extract genotypic effects, we found GWAS peaks for *A* on chromosomes 3, 4, 7, and 10, which overlapped with most of the peaks of stomatal conductance, mesophyll conductance, and electron transport rate, the values of which positively correlated with *A*. Among these peaks, the peak on chromosome 4 was located on *NAL1*, a well-known gene associating photosynthesis, while the other peaks seemed to be uncharacterized genetic factors. These results show that our procedure enables evaluation of photosynthetic diversity in rice cultivars and estimations of novel genetic factors for photosynthetic properties. Determinations of genes underlying these peaks should lead to understand new molecular mechanisms for the photosynthetic control.