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Analysis of the Photosynthetic Characteristics of the High-Yielding Rice Cultivar Takanari

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Abstract:

It was clarified in a previous paper that higher dry matter production for a newly bred high-yielding rice cultivar, Takanari was mainly due to the higher net assimilation rate (NAR) owing to better light-intercepting characteristics after the panicle formation stage. The CO_2 exchange rate, which affects the NAR, was studied using cultivars, Takanari and Nipponbare in this paper. Observations showed that Takanari was remarkably higher in CO_2 exchange rate than Nipponbare during diurnal courses, during leaf- senescence or at different leaf positions. These results indicate that the higher NAR for Takanari was due to not only better light-intercepting characteristics but also a higher CO_2 exchange rate. Furthermore, the cause why these differences in photosynthesis existed between the two varieties was examined. It was found that the CO_2 exchange rates for Takanari maintained a higher level owing to its higher diffusive conductance during diurnal courses, and owing to both its higher diffusive conductance and higher photosynthetic capacity during leaf senescence. Further investigation indicated that the higher photosynthetic capacity for Takanari was mainly owing to a higher apparent carboxylation efficiency and Rubisco content during leaf senescence.

Keywords:

Apparent carboxylation efficiency, Apparent quantum yield, Chlorophyll content, CO_2 exchange rate, Diffusive conductance, Photosynthetic capacity, Rice, Rubisco content

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