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## Characteristics of Gas Exchange and Chlorophyll Fluorescence during Senescence of Flag Leaf in Different Rice (*Oryza sativa* L.) Cultivars Grown under Nitrogen-Deficient Condition

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**Abstract:** Effects of nitrogen (N) deficiency on photosynthetic gas exchange and photosystem II (PSII) photochemistry of flag leaves during grain-filling stage were investigated in six rice cultivars, Kasalath (a conventional *indica*), IR36 (an improved *indica*), Shirobeniya (a conventional *japonica*), Nipponbare (an improved *japonica*), Akenohoshi (an improved *japonica-indica* intermediate type) and BSI429 (an improved tropical *japonica*, a new plant type line) grown hydroponically in N-sufficient (NS) and N-deficient (ND) solution. From 3 to 24 days after heading (DAH), net photosynthetic rate ( $P_N$ ), maximum quantum yield of photosystem II (PSII) ( $F_v/F_m$ ), quantum yield of PSII electron transport ( $\Phi_{PSII}$ ), and contents of chlorophyll (Chl) and ribulose-1,5-bisphosphate carboxylase/oxygenase (Rubisco) in the flag leaves decreased, particularly under the ND condition in all six cultivars. A substantial difference was observed among the ND plants for the sustainability index (SI, the ratio of the value at 24 DAH to that at 3 DAH) of  $P_N$ ,  $F_v/F_m$ ,  $\Phi_{PSII}$ , Chl content and Rubisco content; SIs of those parameters of Akenohoshi, BSI429, Nipponbare and Shirobeniya were higher than those of IR36 and Kasalath. The SI of  $P_N$  showed significant positive correlations with those of  $F_v/F_m$ ,  $\Phi_{PSII}$ , and the contents of Chl and Rubisco under the ND condition. It was concluded that the sustainability of photosynthesis in the flag leaves was mainly due to those of PSII photochemistry and electron transport, which was associated with the maintenance of Chl and Rubisco under the ND condition.

**Keywords:** [Chlorophyll fluorescence](#), [Flag leaf](#), [Leaf senescence](#), [Nitrogen deficiency](#), [Photoinhibition](#), [Photosynthesis](#), [Rice \(\*Oryza sativa\* L.\)](#)

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