

**The activities of antioxidant enzymes induced by light chilling in rice (*Oryza sativa* L.) leaves**

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The adverse effect of chilling treatment (4°C) in the light on the photosynthesis was measured Chlorophyll fluorescence using leaf discs taken from chilling and recovery leaves of rice (*Oryza sativa* L.).

Weak light ( $50 \mu\text{mol m}^{-2}\text{s}^{-1}$ ) was adopted for light chilling to discount the photoinhibitory effect, which was substantiated by decline in the ratio Fv/Fm. Chlorophyll fluorescence measurement showed no significant change in initial fluorescence (F<sub>0</sub>), but notable change in Fv/Fm, Fm and quenching parameters. To investigate the antioxidant defense system, chilling stress-induced changes of antioxidant enzymes were examined in the leaves of rice. Chilling stress enhanced the activities of the superoxide dismutase (SOD) and peroxidase (POD), but ascorbate peroxidase (APX) and catalase (CAT) activities were decreased, when plants leaves returned to 25°C, photosynthetic activity quickly recovered and then diminished the potential power for reactive oxygen species generation. Moreover, during chilling recovery, plants leaves increased APX, CAT and POD, while SOD activity decreased during 1 day recovery. H<sub>2</sub>O<sub>2</sub> content was increased chilling and recovery. As a consequence, oxidation damage due to H<sub>2</sub>O<sub>2</sub> accumulation could occur in rice leaves. In order to analyze the changes of antioxidant enzyme isoforms against chilling stress, foliar extracts were subjected to native PAGE. Five SOD isoforms were presented in the leaves of rice, whereas APX isoforms were more presented than SOD. The intensities of APX-4 and -5 were significantly increased in the recovery after chilling stress. The chilling-induced oxidative stress response of rice cytosolic ascorbate peroxidase was examined. The transcript level of cytosolic APX was significantly increased during chilling. These results indicate that chilling induces the expression of cytosolic APX mRNA and changing to the activity of APX.