

Author: [ADVANCED](#)Volume Page Keyword: 

[TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

ONLINE ISSN : 1349-1008

PRINT ISSN : 1343-943X

Plant Production Science

Vol. 7 (2004) , No. 4 435-441



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Pretreatment with a Low Concentration of Methyl Viologen Decreases the Effects of Salt Stress on Chloroplast Ultrastructure in Rice Leaves (*Oryza sativa* L.)

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(Received: February 4, 2004)

Abstract: We investigated the effects of pretreatment with a low concentration of methyl viologen (MV) on the salinity-induced chloroplast degeneration in rice seedlings. The seedlings grown in hydroponic culture containing nutrient solution for 3 wks were treated with 100 nM MV mixed in the hydroponic culture for 3 days, and then with 200 mM NaCl without MV for 3 days. In the plants without MV pretreatment, the chlorophyll content drastically decreased during the NaCl treatment accompanied by swelling of thylakoids and destruction of thylakoid membranes. These damages were alleviated by the pretreatment with MV. The activities of CuZn-SOD and Fe-SOD, which localize in chloroplasts, increased under salt stress in both plants with and without MV pretreatment. In the plants under salt stress without MV pretreatment, ascorbate peroxidase (APX) activity did not differ from that of control. However, in MV-pretreated plants, APX activity under salt stress was about 1.2- to 1.3-fold higher than that of the control. Catalase (CAT) activity in NaCl treated plants was decreased to 52% of the control and the reduction in CAT activity was suppressed by MV pretreatment. These results suggest that MV reduced the damages by salt stress in chloroplasts by increasing APX activity and preventing the decrease in CAT activity.

Keywords: [Ascorbate peroxidase](#), [Catalase](#), [Methyl viologen](#), [Oryza sativa](#), [Salt stress](#),



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To cite this article:

Koji Yamane, Md. Shahidur Rahman, Michio Kawasaki, Mitsutaka Taniguchi and Hiroshi Miyake: "Pretreatment with a Low Concentration of Methyl Viologen Decreases the Effects of Salt Stress on Chloroplast Ultrastructure in Rice Leaves (*Oryza sativa* L.)". *Plant Production Science*, Vol. 7, pp.435-441 (2004) .

doi:10.1626/pps.7.435

JOI JST.JSTAGE/pps/7.435

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