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Light Dependency of Salinity-Induced Chloroplast Degradation

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Abstract: The contents of Na, K, Cl, chlorophyll and the foliar ultrastructure of rice seedlings grown in NaCl solution at various concentrations were investigated under light and dark conditions. The seedlings were first grown in water for 7 d under a light condition and then in NaCl solutions at various concentrations for 24 h under a light or dark condition. The Na and Cl contents in the 3rd leaves increased as the concentration of NaCl in the culture solution increased, and were significantly higher under a light condition than under a dark condition. The K content was scarcely influenced by the NaCl concentration under both conditions. The chlorophyll content in the 3rd leaves of the seedlings decreased as the NaCl concentrations of the culture solution increased under a light condition but not under a dark condition. In the 3rd leaves of the seedlings grown in the NaCl solution under a light condition, the thylakoids of chloroplasts in mesophyll cells were swollen and showed a wavy configuration. Under a dark condition, however, the thylakoids appeared intact under saline conditions although the leaves accumulated a large amount of Na and Cl than in a light condition. The present study suggests that the damages in the chloroplasts, such as a decrease in the chlorophyll content and the degradation of thylakoids, were caused by a light-dependent reaction and not directly by accumulation of excess salt.

Keywords: Chlorophyll, Chloroplast, Cl content, Na content, Oxidative reaction, Rice, Salt stress, Ultrastructure





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