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Enhanced Germination of Transgenic Tobacco Plants Expressing both CuZnSOD and APX in Chloroplasts under Stress Conditions

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Objectives

Oxidative stress in chloroplasts is one of major damaging factors in plants exposed to environmental stress. In previous study, transgenic tobacco plants expressing both CuZn superoxide dismutase (CuZnSOD) and ascorbate peroxidase (APX) in chloroplasts (referred to as CA plants) showed enhanced tolerances against methyl viologen-mediated oxidative stress (1). In this study, we investigated the protection effect of CA plants on the oxidative stress during the germination.

Material and Method

1. Plant materials: tobacco (*Nicotiana tabacum* cv. Xanthi), transgenic CA plants
2. Stress treatments was from the water imbibition
   - Single stress: low temperature (LT) (15℃), drought (4% PEG 8000), NaCl (100 mM)
   - Combined stress: LT/drought, LT/NaCl, drought/NaCl, LT/drought/NaCl
3. Germination was evaluated as an emergence of radical

Results and Discussion

CA plants showed about 3 times higher germination rate on MS medium at 6 days after imbibition (DAI) compared to non-transgenic (NT) plants. CA plants also showed more than 2 times higher germination rate than NT plants under stress conditions such as a single treatment of low temperature at 15°C and combined treatment (4% PEG 8000 and 100 mM NaCl) at the 11 DAI. Interestingly, CA plants had an significant effect to overcome the delayed germination by all stress conditions. These results suggest that the overexpression of CuZnSOD and APX in chloroplasts may contribute to overcome the oxidative stress derived from various environmental stress conditions during the seed germination. The defense mechanism of CA plants in relation to germination remains to be studied in detail.

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References

Kwon SY et al. (2002) Enhanced tolerance of transgenic tobacco plants expressing both superoxide dismutase and ascorbate peroxidase in chloroplasts against methyl viologen-mediated oxidative stress. *Plant, Cell and Environment* 25: 873-882

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