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Transgenerational Tolerance Memory to Salt Stress in Salt Adapted Rice Plants

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[Introduction]

A sessile plant exposed to environmental stress for a long period often can adapt to stress conditions with improved tolerance. Moreover this acquired tolerance to stress can be transmitted to next generations, which is known as a transgenerational stress memory. Here, we showed that the regenerated rice plants from calli which were grown and adapted on media containing gradually increasing NaCl concentrations, acquired salt tolerance and their enhanced tolerance were inherited to subsequent generation.

[Materials and Methods]

The embryogenic callus were induced rice seeds onto callus induction medium. The callus was adapted to high-salinity through gradually increasing salt from 20 mM to 120 mM NaCl concentration in culture medium every 4 and 6 weeks. The regenerated rice plants (R0; Regeneration-0 generation) under saline conditions were transplanted into normal paddy field and seeds of progeny was harvested. The growth of salt-adapted plants (R2) were determined by measuring survival rate. A week-old seedlings were treated by exchanging growth medium which included 150 mM NaCl and 9-days treatment. After salt treatment, plants were recovery on normal growth medium and then counted the sustainable growing plants.

[Results and Discussion]

The callus derived from R1 seeds showed better growth and the R1 seeds displayed higher germination rate than control in saline condition with 100mM NaCl. Moreover, R1 plants exhibited higher chlorophyll contents as well as higher K^+/Na^+ ratio than wild-type rice under saline growth conditions. The R2 plants grown one more generation in normal paddy field exhibited higher salt tolerance than wild-type. The results indicated that rice plants successfully adapted to saline growth conditions during regeneration on high salt medium and moreover this acquired tolerance to salt stress was inherited subsequent generation.

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