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Development of Calcium-rich Rice by Expression of *Arabidopsis* H⁺/Ca²⁺ antiporter CAX 1

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Objectives

We have tried to develop a calcium-rich rice transformed with CAX 1 gene.

Materials and Methods

1. Explant: Callus derived from 'Ilpumbyeo'.
2. Plasmid - pCAX 1.
3. Medium : Callus induction medium (N6 with 2 mg/L 2,4-D, 2 g/L casein hydrolysate, 30 g/L sucrose, and 5 g/L gelrite), regeneration medium (N6 with 1 mg/L NAA, 5 mg/L kinetin, 50 mg/L kanamycine, 500 mg/L carbenicillin, 30 g/L sucrose and 5 g/L gelrite).

Results and Discussion

The novel gene of *Arabidopsis thaliana* H⁺/Ca²⁺ transporters, CAX 1 (cation exchanger 1), provides resistance activity to abiotic stress in most of agricultural crops. The transient increase of cytosolic free calcium (Ca²⁺) concentrations is essential for the conversion of signals into adapted biological responses. In this study, we introduced CAX 1 of *Arabidopsis thaliana* into a low-calcium japonica rice 'Ilpumbyeo' to increase Ca²⁺ expression by *Agrobacterium-mediated* transformation. The NPT II gene was used as a selectable marker. The activity of neomycin phosphotransferase could be successfully detected in transgenic rice callus. The introduction of CAX 1 gene was approved also by PCR using CAX 1 specific oligonucleotide primers in regenerated plants. Southern blot analysis of T₀ plants revealed that the most of transformants were carried with a single copy of CAX 1. The analysis of fluo-4 indicator for the cytosolic Ca²⁺ distribution in the tissues showed transiently accumulation of Ca²⁺ by successful expression of CAX 1. The calcium-rich rice will be applied to improve the grain quality and cold tolerance of rice.