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Transgenic Barley Plants Expressing Nucleoside Diphosphate Kinase 2

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Objectives

To develop transgenic barley plants with enhanced tolerance to multiple environmental stresses, we successfully generated transgenic barley expressing nucleoside diphosphate kinase 2 (NDPK2)¹ gene under the control of an oxidative stress-inducible SWPA2 promoter². The tolerance of transgenic barley plants to oxidative stress will be introduced.

Materials and Methods

1. Material: Embryogenic callus of barley (cv. Doowonchal, Igri)
2. Methods
 - 1) Expression vector: SWPA2pro::NDPK2+pUBI::BAR (SN-B vector)
 - 2) Transformation: particle bombardment method
 - 3) Molecular analysis: PCR and Southern blot analysis
 - 4) Stress tolerance analysis: Leaf disc test using methyl viologen

Results and Discussion

Transgenic barley plants (SN plants) were successfully developed by a particle bombardment. Embryogenic calli were induced from germinated mature embryos, and cultured on CIM medium and CI3D in dark condition. Transgenic calli were successfully regenerated on the selection CIR medium containing 3 mg/l phosphinothricin in light condition. PCR and Southern blot analyses confirmed that NDPK2 gene was properly integrated into the nuclear genome in five plantlets among 75 regenerated plants. Transgenic SN plants were survived after applying 0.5% Basta treatment. The tolerance of transgenic SN plants to environmental stresses including methyl viologen (paraquat)-mediated oxidative stress is under study.

References

- 1) Moon et al., NDP kinase 2 interacts with two oxidative stress-activated MAPKs to regulate cellular redox state and enhances multiple stress tolerance in transgenic plants (2003) PNAS 100: 358-363
- 2) Kim et al., A novel oxidative stress-inducible peroxidase promoter from sweetpotato: molecular cloning and characterization in transgenic tobacco plants and cultured cells (2003) Plant Mol Biol 51: 831-838