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Transgenic potato plants expressing multiple antioxidant genes in chloroplast and cytosol

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Objectives

To develop transgenic potato plants (referred to as SSAN plants) with enhanced tolerance to multiple environmental stresses, nucleoside diphosphate kinase 2 (NDPK2) gene regulating expression of antioxidant genes (1,2) was further introduced into transgenic potato plants (SSA plants) expressing both superoxide dismutase (CuZnSOD) and ascorbate peroxidase (APX) genes in chloroplasts under the control of an oxidative stress-inducible *SWPA2* promoter (3). In a previous study, both SSA plants and SN plants expressing NDPK2 showed enhanced tolerance to multiple environmental stress such as methyl violgen-mediated oxidative stress and high temperature.

Materials and Methods

1. Material

- * Plant - SSA potato (*Solanum tuberosum* L.) cv. Atlantic
- * Explants - leaves, stems
- * Vector - *SWPA2*pro::mSOD1+*SWPA2*::APX/pCAMBIA2300/EHA105 (SSA vector)
*SWPA2*pro::NDPK2/pCAMBIA1300/EHA105 (SN vector)

2. Methods

- * *Agrobacterium*-mediated transformation, PCR analysis, Southern blot analysis

Results and Discussion

To generate transgenic potato plant (SSAN plant), SN vector was introduced into SSA plants through an *Agrobacterium*-mediated transformation system. Twenty five SSAN potato plants were successfully regenerated on MS medium containing 0.01 mg/L NAA, 0.1 mg/L GA₃, 2 mg/L zeatin, 500 mg/L cefotaxim and 100 mg/L kanamycin. The integration of foreign gene in transgenic plants was confirmed by PCR with hygromycin B and NDPK2 primer. Further molecular and biochemical characterization of transgenic plants is under study in terms of multiple stresses. We anticipate that further expression of NDPK2 gene in SSA plants will have more enhanced tolerance to multiple environmental stresses than SSA plants or SN plants.

References

1. Moon et al. (2003) Proc Natl Acad Sci USA 100: 358-363
2. Yang et al. (2003) Proc Jap Acad 79(Ser B): 86-91
3. Kim et al. (2003) Plant Mol Biol 51: 831-838