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Characterization of transgenic poplar plants expressing antioxidant genes

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Objectives

Injury caused by reactive oxygen species (ROS), known as oxidative stress, is one of the major damaging factors in plants exposed to environmental stress. In our previous studies, transgenic plants such as potato, sweetpotato and rice expressing both CuZnSOD and APX into chloroplasts, or expressing NDPK2 gene into cytosols showed enhanced tolerance to multiple environmental stress including methyl viologen-mediated oxidative stress. In this study, to develop transgenic poplar plants with enhanced tolerance to multiple environmental stresses including air pollution and drought, we introduced both CuZnSOD and APX into chloroplasts, and NDPK2 gene into cytosols under the control of an oxidative stress-inducible *SWPA2* promoter (referred to as SSA plants and SN plants, respectively) and their protection effect was evaluated against methyl viologen-mediated oxidative stress.

Materials and Methods

1. Material

- * Plant - Hybrid poplar (*Populus alba* × *Populus glandulosa*)
- * Vectors - *SWPA2pro::mSOD1+SWPA2::APX/pCAMBIA2300/EHA105* (SSA vector)
SWPA2pro::NDPK2/pCAMBIA2300/EHA105 (SN vector)

2. Methods

- * Callus induction medium- MS salt, 1.0 mg/L 2,4-D, 0.1 mg/L BAP, 0.01 mg/L NAA, 500 mg/L cefotaxim and 50 mg/L kanamycin
- * Shoot induction medium -WPM salt, 1.0 mg/L zeatin, 0.1 mg/L BA, 0.01 mg/L NAA, 500 mg/L cefotaxim and 50 mg/L kanamycin
- * *Agrobacterium*-mediated transformation, PCR analysis, Southern blot analysis, methyl viologen (MV) treatment

Results and Discussion

Two expression vectors, such as SSA vector and SN vector were used to generate transgenic poplar plants by an *Agrobacterium*-mediated transformation system. Transgenic shoots were regenerated on WPM medium containing 1.0 mg/L zeatin, 0.1 mg/L BA, 0.01 mg/L NAA, 500 mg/L cefotaxim, and 50 mg/L kanamycin after 4 weeks of culture. Transgenic poplar plants was confirmed by PCR and Southern blot analysis. The biochemical characterization of transgenic poplar plants are investigated in terms of oxidative stress. We anticipate that transgenic poplar plants will be useful for cultivation in the harsh area including air pollution and drought.

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