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Transgenic tobacco plants harboring *E. coli* TPS (trehalose-6-phosphate synthase) gene (*ots A*) were generated by leaf disc transformation. Transgenic plants were identified by PCR, Northern hybridization, and trehalose synthesis. All lines of transgenic plants manifested stunted growth and extended generation time in varying degree. In addition, transgenic plants typically exhibited some morphological changes. Leaves became longer and thinner to form lancet-shaped and some leaves were severely irregular-shaped with curls and wrinkles. There were observed increased number of leaves with more vestigial branches along the main stem. The stunted growth was not accompanied with early senescence or necrosis. Homozygous plants obtained in F2 generation were used to test their physiological and photosynthetic responses against dehydration. All transgenic plants showed enhanced tolerance to dehydration as shown by improved retention in fresh weight upon air-drying or by 10% (w/v) PEG treatment. However, decrease in water potential by dehydration through PEG-treatment was in parallel phase in both nontransformants and transgenic plants. Furthermore, decrease in Pmax occurred to the similar extent in both nontransformants and transgenic plants, implying that trehalose confers only higher water retaining ability against dehydration, but not without holding photosynthetic capacity. On the other hand trehalose producing plants showed improved ability of holding photosynthetic activity against high temperature.

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