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Improvement of Water Stress Tolerance by Efficient Stomatal Control and Enhancement of Osmotic Adjustment in Transgenic

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Objectives

To assess the resistive characteristics of transgenic sweetpotato plants to water stress we measured changes in maximum photochemical efficiency and leaf water status under water stressed conditions, and evaluated the ability to recover from water stress.

Material and Methods

1. Material

Fully developed leaves from pot grown transgenic and non-transgenic sweetpotato (*Ipomoea batatas* Lam. Cv. Yulmi) plants were used as plant material.

2. Methods:

Water stress treatment using detached leaves was carried out in an environment-controlled room with 25°C in temperature, 60 % RH and photon flux density of 10 umoles m^{-2} s^{-1}. Leaf water potential and osmotic potential of leaves were measured with Microvolt Meter (Wescor). Photochemical efficiency of PSII of leaves was measured with FMS II (Hansatech). Recovery experiment of leaves from water stress was performed in a small chamber saturated with vapor. Relative water content of leaves was determined from saturated weight, fresh weight and dry weight after drying of leaves at 80 °C for 48 hours.

Results and Discussion

Leaf water potential of non-transgenic (NT) plants markedly decreased to – 5.1 bars on five hours after the start of water stress treatment, while those of transgenic plants maintained – 3.02 bars. In addition, relative water content of leaf in transgenic plants was also maintained high under water stressed conditions, indicating efficient control of stomata. Fv/Fm indicating maximum photochemical efficiency of PS II decreased with reduction of leaf water potential in both plants. However, NT plants showed more rapid reduction in Fv/Fm compared with transgenic plants, meaning that NT plants are highly susceptible to water stress than transgenic plants.

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