

Title Severity of chilling injury of sweet potato shoots is affected by pre-treatment of H₂O₂ and NaCl

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Abstract

Excised shoot tips of sweet potato (*Ipomoea batatas* L.) were incubated in H₂O₂ or NaCl aqueous solution for 24 or 48h prior to a 3-day chilling at 2.5°C. Severity of injury was visually observed during a post-chilling 7-day recovery at 21°C, and scored at 0 to 5 (none to most severe injury). There were three experiments: the first two experiments were conducted in summer, and the third in winter. In the first experiment, when cv. Purple (PUR) sweet potato shoots were subjected to 3-day chilling at 2.5°C, a 48h pre-treatment of 150 mM H₂O₂ under 16h photoperiod reduced chilling injury, but H₂O₂ showed no effect under 8h photoperiod. An increase of Oxygen Radical Absorbance Capacity (ORAC) occurred two days after recovery at room temperature, and such increase in ORAC was negatively correlated with the severity of chilling injury symptoms observed after seven days at room temperature, indicating the possible protective nature of antioxidants. Because H₂O₂-reduced chilling injury occurred only on those pretreated with 16h photoperiod, 16h was employed in the second experiment involving NaCl. In the second experiment, 4 cvs were used: Ace of Spades (ACE), B 18, Purple (PUR), and Toka Toka Gold (ITG). A 3 x 2 factorial experiment was applied to each of the four cultivars: 3 NaCl rates (0 mM, 200 mM or 400 mM) and 2 incubation time (24h or 48h). The effects of NaCl depended on cultivar (cv). Sodium chloride at 200mM reduced chilling injury more for ACE than B18 and PUR, but NaCl increased the injury of TTG. The NaCl effects also depended on incubation time (24h or 48h). Across 4 cvs the most beneficial NaCl treatment was 200 mM NaCl for 24h. In the third experiment, a factorial of 2 NaCl rates (0 mM vs 200 mM NaCl) and 2 photoperiods (8h vs 16h), showed different effects: photoperiods immediately prior chilling showed no effect on resulting severity of chilling injury, and the benefit of NaCl was profound in B18, marginal in TTG and ACE, and detrimental in PUR. In view of these results, pre-treatments of H₂O₂ or NaCl may reduce chilling injury of sweet potato shoots under specific conditions, depending on cultivars and growing seasons.