Title Effects of mannitol on turgor and on failure stress and strain in potato tuber tissue

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Abstract

Discrepancies between preliminary results and published literature prompted an investigation into the effects of mannitol manipulation of turgor on failure stress and strain in potato tuber tissue. Tissue samples from two potato tuber cultivars (*Solanum tuberosum* cv. Russet Burbank and Atlantic) were treated in 0.15 M (hypotonic) and 0.35 M (hypertonic) mannitol ($C_6H_{14}O_6$) solutions to determine whether mannitol changes fundamental tissue failure properties beyond the effects of turgor change. The use of mannitol for turgor pressure adjustment either above or below the isotonic concentration resulted in distortion of tuber tissue failure properties under dynamic axial loading conditions for potato tissue samples 10 mm in diameter by 15 mm long for both the Russet Burbank and Atlantic cultivars. Sample length did change and shock wave speed (a small strain property) behaved similarly to samples naturally dehydrated. However, the failure stress and strain tended to increase with time regardless of the mannitol treatment, even when these variables should have decreased. Results of this work confirm that mannitol solutions alter both turgor and the potato tuber tissue failure properties under dynamic loading and therefor should not be used to adjust turgor pressure in experiments investigating failure properties.