**Title** Dehydration accelerates respiration in postharvest sugarbeet roots

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**Abstract**

Sugarbeet (*Beta vulgaris* L.) roots lose water during storage and often become severely dehydrated after prolonged storage and at the outer regions of storage piles which have greater wind and sun exposure. Sucrose loss is known to be elevated in dehydrated roots, although the metabolic processes responsible for this loss are unknown. To identify processes that contribute to sucrose loss in dehydrated roots, respiration rate, cellular electrolyte leakage, and sucrolytic enzyme activities were determined in roots of two varieties (VDH 66156 and Beta 4797R) during 4 weeks of 10 °C storage at high (85%) and low (40%) relative humidities. Roots stored at 40% relative humidity dehydrated significantly and lost almost 50% of their weight after 4 weeks of storage. Electrolyte leakage increased in these roots, indicating that dehydration damaged cellular membranes. Respiration rate generally increased in roots stored at 40% relative humidity compared to roots stored at 85% relative humidity. The increase in respiration rate was positively correlated with root weight loss and electrolyte leakage. Respiration rate was most closely associated with electrolyte leakage, however, suggesting that elevations in respiration rate were not due to dehydration, but to the membrane damage that occurred in response to dehydration. Activities of the sucrose-degrading enzymes, sucrose synthase, alkaline invertase and soluble acid invertase, were unaltered by dehydration. Alterations in sucrolytic enzyme activities, therefore, were not needed to provide for the increased demand for respiratory substrates in dehydrated roots. These results suggest that storage at low relative humidity alters the postharvest physiology of sugarbeet roots by increasing the rate of weight loss, reducing membrane integrity, and accelerating root respiration rate.