Abstract

Sucrose catabolism during postharvest storage of sugarbeet (*Beta vulgaris* L.) root has been the subject of several studies; yet, no consensus exists about the contribution of the major sucrolytic activities to postharvest sucrose loss. Because differences in storage temperature, length of storage, and the presence of storage pathogens may have contributed to the discrepant results from earlier studies, the impact of these three factors on sugarbeet root postharvest sucrose catabolism was determined. Sucrolytic activities and soluble carbohydrate concentrations were measured in roots exhibiting no pathological symptoms during storage at 6, 12, and 21 °C and in roots exhibiting severe rotting symptoms due to infection by *Penicillium* spp. and *Botrytis cinerea* during storage at 6 °C. Sucrose synthase was the predominant sucrolytic activity throughout storage, regardless of storage temperature, length of storage, or pathogenesis, and accounted for more than 90% of the total soluble sucrolytic activity present in roots. In disease-free roots, no significant change in sucrose synthase activity, soluble acid invertase activity, or insoluble acid invertase activity occurred in roots stored at 6 or 12 °C, although an increase in sucrose synthase activity was observed in roots stored at 21 °C. Alkaline invertase activity was impacted by the length of storage and exhibited a transient decline in activity at all storage temperatures. Glucose and fructose concentrations generally increased as a function of time in storage at 6, 12, and 21 °C. In roots with severe rot, insoluble acid invertase activity declined, sucrose synthase and alkaline invertase activities were unchanged, and soluble acid invertase increased seven-fold. The increase in soluble acid invertase activity was primarily due to the presence of fungal acid invertase isoforms. These results indicate that sugarbeet sucrolytic activities change little during storage, regardless of storage temperature, length of storage, and pathogenesis, and suggest that sucrose synthase, as the predominant sucrolytic activity in stored roots, is central to postharvest sucrose catabolism in sugarbeet roots.