Methyl jasmonate effects on sugarbeet root responses to postharvest dehydration

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ABSTRACT
Background. Sugarbeet (*Beta vulgaris* L.) roots are stored under conditions that cause roots to dehydrate, which increases postharvest losses. Although exogenous jasmonate applications can reduce drought stress in intact plants, their ability to alleviate the effects of dehydration in postharvest sugarbeet roots or other stored plant products is unknown. Research was conducted to determine whether jasmonate treatment could mitigate physiological responses to dehydration in postharvest sugarbeet roots. **Methods.** Freshly harvested sugarbeet roots were treated with 10 µM methyl jasmonate (MeJA) or water and stored under dehydrating and non-dehydrating storage conditions. Changes in fresh weight, respiration rate, wound healing, leaf regrowth, and proline metabolism of treated roots were investigated throughout eight weeks in storage. **Results.** Dehydrating storage conditions increased root weight loss, respiration rate, and proline accumulation and prevented leaf regrowth from the root crown. Under dehydrating conditions, MeJA treatment reduced root respiration rate, but only in severely dehydrated roots. MeJA treatment also hastened wound-healing, but only in the late stages of barrier formation. MeJA treatment did not impact root weight loss or proline accumulation under dehydrating conditions or leaf regrowth under non-dehydrating conditions. Both dehydration and MeJA treatment affected expression of genes involved in proline metabolism. In dehydrated roots, proline dehydrogenase expression declined 340-fold, suggesting that dehydration-induced proline accumulation was governed by reducing proline degradation. MeJA treatment altered proline biosynthetic and catabolic gene expression, with greatest effect in non-dehydrated roots. Overall, MeJA treatment alleviated physiological manifestations of dehydration stress in stored roots, although the beneficial effects were small. Postharvest jasmonate applications, therefore, are unlikely to significantly reduce dehydration-related storage losses in sugarbeet roots.

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