

Title Involvement of the phenylpropanoid pathway in the response of table grapes to low temperature and high CO₂ levels

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Abstract

We have analyzed the responses induced by low temperature storage (0 °C) in red table grape (*Vitis vinifera* L. cv. Cardinal) and also the effect of a 3 day treatment of high CO₂ levels (20% CO₂ plus 20% O₂). At the transcriptional level we studied the key phenylpropanoid enzymes l-phenylalanine ammonia-lyase (PAL), chalcone synthase (CHS) and stilbene synthase (STS), together with the final products of some of these enzymes, such as *trans*-resveratrol and total anthocyanin, and their involvement in antioxidant activity. The results, using previously isolated partial cDNAs, indicated that storage at 0 °C for 3 days increased *VcPAL*, *VcSTS* and *VcCHS* mRNA levels in the skin of non-treated grapes, decreasing slightly thereafter. In contrast, the accumulation of these transcripts was lower in the skin of grapes after 3 days of CO₂ treatment, and was undetectable when treated fruit were transferred to air. Low temperature modulated total anthocyanin levels and antioxidant capacity in non-treated grapes, and reduced the *trans*-resveratrol content in both treated and non-treated grapes, although the decrease was higher in CO₂-treated grapes. The overall results indicated that CO₂-treated grapes could be less sensitive to temperature shifts during the first stages of storage at 0 °C, reducing the expression levels of phenylpropanoid genes and the accumulation of total anthocyanins and antioxidant activity.