

Title Transcriptomic analysis of the response of cardinal table grapes to low temperature and high CO₂ levels

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Abstract

Postharvest storage life of table grapes is limited due to their high sensitivity to fungal attack. A 3 days high CO₂ pretreatment was effective for maintaining the quality of Cardinal berries, but little is known about its mode of action at molecular levels. To gain a better understanding of the molecular mechanisms involved in the responses of grapes to low temperatures and high CO₂ levels, we have performed genome-wide transcriptional profiling analysis of RNA isolated from the skin of Cardinal berries using a custom Affymetrix GeneChip that includes probes for 23,096 unigenes developed within the GrapeGen project. From this analysis we found that 258 probe sets were specifically affected by high CO₂ levels, 137 probe sets were specifically expressed in the skin of berries stored at low temperature in air and 97 probe sets were significantly affected by both low temperature and the gaseous treatment. In response to low temperature storage about 43% of the core gene set was characterized by genes involved in cell wall, gibberellin, lipid and fatty acid metabolism, as well as biotic stress, proteolysis, signal transduction and transcription factors. By contrast, high CO₂ levels specifically affected to adaptation processes that involve changes in the expression of transcripts related to carbohydrate and cell wall metabolism, electron and metabolite transport, oxidative stress, signal transduction and transcription factors. The authors are grateful to Jose Miguel Martinez Zapater (CNB, Madrid) and Genoma Espana for providing the custom GeneChip.