Hydrogen sulfide inhibits the browning of fresh-cut apple by regulating the antioxidant, energy and lipid metabolism

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Abstract

Surface browning is the primary limiting factor for the shelf-life of fresh-cut apple. Hydrogen sulfide (H_2S) treatment is known to effectively inhibit the browning, however, little is known about the underlying molecular mechanism. In the present paper RNA-Seq technology was used to analyse the transcript expression profiles of control and H_2S treated fresh-cut apple immediately after treatment (C0 and S0) and 6 d of storage (C6 and S6) at 4 °C. The results identified 3782 and 1164 differentially expressed unigenes (DEGs) in S0 *vs.* C0 and S6 *vs.* C6, respectively. Expression of most DEGs related to antioxidant systems and energy metabolism was up-regulated after H_2S treatment, whilst expression of genes encoding polyphenol oxidase, peroxidase, lipid-degrading enzymes, such as lipoxygenase and phospholipase D, was repressed. Further quantitative real-time PCR testing validated the reliability of our RNA-Seq results. We therefore propose that H_2S treatment inhibited the surface browning of fresh-cut apple by regulating antioxidant, energy and lipid metabolism to maintain the membrane integrity of the plant tissue.