Molecular cloning and expression analysis of hydrogen peroxide sensors under H_2O_2 and ROS inhibitor treatment in 'Kyoho' grape berry

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Abstract

Hydrogen peroxide is an important factor involved in the senescence and quality deterioration of postharvest fruit. However, few studies have examined hydrogen peroxide sensors and their expression patterns in grape. Here, postharvest grape berries were treated with H_2O_2 and the ROS inhibitor hypotaurine (HT). HT reduced the H_2O_2 content by increasing ROS-scavenging enzyme activity, whereas H_2O_2 accelerated senescence. Four hydrogen peroxide sensors (*VvHPCA1*, *2*, *3*, and *4*) were identified and isolated from the grape genome. Sequence analysis indicated that *VvHPCAs* shared a conserved structure, including the LRR-RK and hydrogen peroxide (HP) domains, with other homologous hydrogen peroxide sensor genes. Furthermore, the expression patterns of the four *VvHPCAs* were investigated under H_2O_2 and HT treatment in grape. The expression levels of the four *VvHPCA*s were lower in grape berries treated with HT than in grape berries treated with H_2O_2 or water treatment (Control) in at least one of the sampling points during storage. VvHPCAs are cytomembrane proteins with stress-responsive cis-acting elements in their promoters, indicating that these four identified VvHPCAs might function as hydrogen peroxide sensors in grape and regulate hydrogen peroxide signaling and metabolism. Thus, VvHPCAs are capable of responding to postharvest ROS stress. These findings provided new insight into the function of these four VvHPCAs, which are potential candidate genes involved in regulating ROS stress in grape.