Reduction of enzymatic browning of fresh-cut guava fruit by exogenous hydrogen peroxide-activated peroxiredoxin/thioredoxin system

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Abstract

Abiotic stresses in plants are commonly caused by antioxidant system imbalance in their tissues. A peroxiredoxin/thioredoxin (Prx/Trx) system is a ubiquitous antioxidant system involved in sensing and detoxifying hydrogen peroxide (H_2O_2) and other reactive oxygen species (ROS). This study investigated exogenous H_2O_2 potential in reducing browning and its interaction with the Prx/Trx system in fresh-cut guava fruit during storage at 25 °C. Fresh-cut guava samples were immersed in 0 (control) and 250 mM H_2O_2 for 10 min, placed on a foam tray, packed inside a polyethylene bag and kept at 25 ± 1 °C for 48 h. The H_2O_2 treatment reduced browning and maintained fresh-cut guava fruit quality during storage. The H_2O_2 treatment reduced oxidative membrane damage and an accumulation of ROS, but activated the Prx/Trx system by stimulating the activities of peroxiredoxin and thioredoxin reductase, and NADPH-generating dehydrogenases including glucose-6-phosphate dehydrogenase and 6-phosphogluconate dehydrogenase as well as an increase in NADP redox state. The altered redox state and the activation of the Prx/Trx system by H_2O_2 was correlated with delayed browning of fresh-cut guava. Thus, the Prx/Trx system is involved in browning development, and H_2O_2 treatment could delay browning in fresh-cut guava by reducing oxidative membrane damage via stimulating the Prx/Trx system.