Title : Effects of hydrogen peroxide on oxidative damage and programmed cell death of guava fruit during chilling injury development

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ABSTRACT

During transportation, guava *(Psidium guajava Linn.)* must be stored at low temperatures (8-12°C) to extend its shelf life. However, a major challenge in cold storage is chilling injury (CI), which leads to quality deterioration, reduced storage longevity and shortened marketability. This study aimed to investigate the effects of hydrogen peroxide (H_2O_2) solution on oxidative damage and cell death in 'Kim Ju' guava during the development of chilling injury. Fresh guava fruits were treated by immersion in H_2O_2 solutions at 0 (control), 50, 250 and 500 mM and in dimethyl thiourea (DMTU), H_2O_2 scavenger, solutions at 0 (control), 50, 250, and 500 mM for 10 min. Fruits were then packed in cardboard boxes and stored at 8 °C with 82±5% relative humidity for 14 days, followed by 4 days at 25 °C to simulate shelf-life conditions. The results showed that 250 mM H_2O_2 treatment intensified CI symptoms, whereas 2.5 mM DMTU treatment significantly reduced CI symptoms compared to the control. Evaluations included CI symptoms (visual assessment), CI index (CI index) and overall fruit quality. Moreover, 250 mM H_2O_2 treatment led to the highest oxidative damage and cell death, while 2.5 mM DMTU treatment effectively reduced oxidative stress and cell death compared to the control. Analyses included hydroxyl radical and hydrogen peroxide accumulation, malondialdehyde content, electrolyte leakage, trypan blue staining (to assess cell death), polyphenol oxidase and peroxidase enzyme activities and total phenolic content. This study concludes that H_2O_2 plays a significant role in oxidative damage and cell death, contributing to chilling injury

development of guava fruit during low-temperature storage.