

Reactive Oxygen Species (ROS) Scavenging in Hot Air Preconditioning Mediated Alleviation of Chilling Injury in Banana Fruits

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Abstract

Banana fruits (*Musa* sp., AAA group, Cavendish subgroup cv. 'Williams') were exposed to two hot air treatment regimes namely 50°C for 10 minutes (HAT A) and 40°C for 60 minutes (HAT B). The fruits were then stored at chilling temperatures (8°C) for up to 21 days to evaluate the efficacy the treatments on chilling injury (CI) alleviation and activity of reactive oxygen species (ROS) following the treatments. The hot air treatments initially disrupted normal cellular functions as evidenced by higher percentage of initial ion leakage. However upon transfer to cold storage, the trend was reversed and ion leakage was higher in the untreated controls compared to the treated bananas. Symptoms of CI appeared earlier (5th day) and progressed faster in the untreated controls compared to the treated bananas. The slow progression of CI in treated bananas was accompanied by increased reactive oxygen species (ROS) scavenging capacity. This was evidenced by higher activity of antioxidant enzymes including superoxide dismutase (SOD), catalase (CAT), guaiacol peroxidase (POD) and ascorbate peroxidase (APX), in the treated bananas. Similarly, the components of the ascorbate-glutathione cycle were positively affected by the hot air treatments. The content of reduced glutathione (GSH) and reduced ascorbic acid (AsA) were slightly higher, contributing to the higher antioxidant potential in the treated bananas; this further enhanced the ROS scavenging capacity. Moreover the activity of glutathione reductase (GR) which is essential in recycling glutathione was slightly higher in the treated bananas. These results indicate that the increased antioxidants' content and antioxidant enzymes' activity triggered by hot air treatments positively enhanced the bananas' tolerance to chilling temperature.