

# Hydrogen sulfide treatment confers chilling tolerance in hawthorn fruit during cold storage by triggering endogenous H<sub>2</sub>S accumulation, enhancing antioxidant enzymes activity and promoting phenols accumulation

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## Abstract

Cold storage as the postharvest beneficial procedure has been used for retaining sensory and nutritional quality and extending postharvest life of hawthorn fruit. However, fruit chilling injury (CI) manifested by pitting is a dominant restriction for applying cold storage for hawthorn fruit. In this experiment, the impacts of postharvest hydrogen sulfide (H<sub>2</sub>S) fumigation releasing from 0, 0.5, 1 and 1.5 mM H<sub>2</sub>S donor NaHS on chilling injury manifesting by pitting and nutritional quality of hawthorn fruit during storage at 1 °C for 20 days was evaluated. Our results revealed that 1.5 mM H<sub>2</sub>S donor NaHS treatment remarkably ameliorated fruit chilling injury, which was accompanied by lower malondialdehyde (MDA) accumulation. Hawthorn fruit in response to H<sub>2</sub>S donor NaHS treatment showed remarkably higher endogenous H<sub>2</sub>S accumulation by triggering l-cysteine desulphydrase (LCD) and d-cysteine desulphydrase (DCD) enzymes activity, which coincided with higher reactive oxygen species (ROS) scavenging enzymes superoxide dismutase (SOD), catalase (CAT), and ascorbate peroxidase (APX) activity give rise to lower H<sub>2</sub>O<sub>2</sub> accumulation. In addition, hawthorn fruit treated with H<sub>2</sub>S showed remarkably higher phenols, flavonoids, and anthocyanins accumulation by triggering phenylalanine ammonia lyase (PAL) enzyme activity. Higher DPPH scavenging activity in hawthorn fruit treated with H<sub>2</sub>S donor NaHS arise from higher phenols, flavonoids, anthocyanins and ascorbic acid accumulation. According to our results, postharvest 1.5 mM H<sub>2</sub>S donor NaHS applying may be considered as a beneficial procedure not only for conferring chilling tolerance of hawthorn fruit by triggering

endogenous H<sub>2</sub>S accumulation, enhancing ROS scavenging enzymes activity and promoting phenols accumulation which are crucial for maintaining membrane integrity, but also for preserving nutritional quality of hawthorn fruit during cold storage.