

Hydrogen sulfide maintains good nutrition and delays postharvest senescence in postharvest tomato fruits by regulating antioxidative metabolism

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Abstract

As a signaling molecule, hydrogen sulfide (H_2S) plays an indispensable role in the modulation of ripening and senescence in fruits and vegetables. To explore the role of H_2S in regulating metabolism of postharvest tomato, ripening-related physiological parameters, activities of antioxidant enzymes and gene expression were analyzed in H_2S -fumigated tomato fruits. These results show that H_2S significantly delayed the color transition and softening of tomato fruit, and maintained higher level of flavonoids and lower level of anthocyanin during storage. Besides, H_2S could maintain higher level of nutritional-related metabolites, such as reducing sugar, ascorbic acid during postharvest storage. Moreover, H_2S decreased the rate of O_2^- production, inhibited the production of H_2O_2 and malondialdehyde (MDA), enhanced the activities of antioxidant enzymes including ascorbate peroxidase (APX), superoxide dismutase (SOD), catalase (CAT) and guaiacol peroxidase (POD) in tomato fruits, while reduced the activities of phenylalanine ammonia lyase (PAL), polyphenol oxidase (PPO) and lipoxygenase (LOX). Besides, the expression of the antioxidant-encoding genes *SlCAT2*, *SlPOD12* was generally upregulated with H_2S fumigation. Principal component analysis (PCA) suggests that H_2S induced significant discrepancy mainly to the differences in firmness, anthocyanin, flavonoid and the activity of guaiacol peroxidase (POD), and the correlation analysis further shows that H_2S affected pigment metabolism and nutritional quality. In conclusion, H_2S could maintain better appearance and nutritional quality, and prolong the storage period of postharvest tomato fruits through activating the antioxidative system.