Strigolactone maintains strawberry quality by regulating phenylpropanoid, NO, and H_2S metabolism during storage

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Abstract

Strawberries (*Fragaria × ananassa* Duch. cv. Akihime) were treated with different concentrations of exogenous strigolactone (SL) (0, 0.5, 1, 2, and 4 μmol L^{-1}). Changes in the antioxidant system, nitric oxide (NO) synthesis, hydrogen sulfide (H_2S) synthesis, and phenylpropanoid metabolism of postharvest strawberries were studied. Among the treatments, 1 μmol L^{-1} SL significantly inhibited peroxidase and polyphenol oxidase activities, and enhanced the ability to scavenge ·DPPH, ·OH, and $\cdot O_2^-$. Treatment with 1 μmol L^{-1} SL effectively reduced weightlessness rate and respiratory intensity, maintained the water content, inhibited the increase in POD activity and the decrease in the activities of CAT and SOD, maintained the reduced ascorbic acid, and reduced glutathione contents. Exogenous SL effectively increased the activities of 4-coumaric acid coenzyme A ligase and phenylalanine ammonia-lyase, thus promoting the accumulation of flavonoids, lignin, and total phenols. These findings suggested that SL alleviated the oxidative damage of strawberries by improving the defense capability of the antioxidant system. SL improved nitric oxide synthase (NOS)-like activity and the contents of l-arginine and endogenous NO, but had no significant effects on nitrate reductase activity and nitrite content, suggesting that SL regulates the synthesis of NO mainly through the NOS-like pathway. Exogenous SL promoted the cleavage of l-cysteine by activating l-cysteine desulfhydrase, d-cysteine desulfhydrase, *O*-acetylserine thiolyase, and serine acetyltransferase, thus increasing endogenous H_2S content in strawberries. SL maintained fruit quality by improving the antioxidative system and the metabolism of phenylpropanoid, NO, and H_2S in strawberries during storage.