Exogenous ATP attenuated fermentative metabolism in postharvest strawberry fruit under elevated CO_2 atmosphere by maintaining energy status

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Postharvest Biology and Technology, Volume 182, December 2021, 111701

Abstract

Elevated CO_2 shows adverse effects in horticultural crops including off-flavor formation and carbohydrate consumption. Here, 1 mM adenosine triphosphate (ATP) was applied to strawberry fruit under 20% CO_2 atmosphere to investigate its regulation on fermentative and carbohydrate metabolism. The results showed that ATP treatment increased endogenous ATP content by 27%, and delayed the decrease of energy charge under elevated CO_2 atmosphere. Exogenous ATP showed no adverse effects on fruit firmness and color but attenuated the accumulation of acetaldehyde and ethanol, which were 72% and 75% lower in ATP+CO_2-treated fruit compared CO_2-treared fruit, respectively. The inhibition of fermentative metabolism resulted from the repression of pyruvate decarboxylase (PDC), alcohol dehydrogenase (ADH) activities, as well as *FaADH* expression. Meanwhile, ATP treatment also maintained carbohydrate levels under elevated CO_2 atmosphere, with 6%, 7%, and 11% more glucose, fructose and sucrose observed at the end of the storage period as compared with the CO_2-treated group, respectively. The down-regulation of enzymes activities and gene expressions involved in sucrose catabolism and glycolysis may account for the inhibition of carbohydrate consumption. These results indicated that exogenous ATP might be a strategy to optimize elevated CO_2 treatment to avoid its adverse effects.