

Exogenous melatonin maintains leaf quality of postharvest Chinese flowering cabbage by modulating respiratory metabolism and energy status

Xiao-li Tan, Zhong-qi Fan, Ze-xiang Zeng, Wei Shan, Jian-fei Kuang, Wang-jin Lu, Xin-guo Su, Neng-guo Tao, Prakash Lakshmanan, Jian-ye Chen and Ya-ting Zhao

Postharvest Biology and Technology, Volume 177, July 2021, 111524

Abstract

The efficacy of melatonin on postharvest quality of Chinese flowering cabbage was investigated in this study. Treatment of Chinese cabbage with melatonin significantly delayed leaf yellowing and maintained higher contents of nutrients such as soluble sugars, protein, vitamin C, total flavonoids and phenols during a 7-day storage. Also, melatonin enhanced the activities and expression level of glucose-6-phosphate dehydrogenase (G6PDH) and 6-phosphogluconate dehydrogenase (6-PGDH). Melatonin treatment decreased tissue weight loss, respiration rate, activities of phosphohexose isomerase (PHI), succinate dehydrogenase (SDH), cytochrome C oxidase (CCO), and ascorbic acid oxidase (AAO) and the expression of their corresponding genes. Additionally, melatonin-treated leaves maintained high energy status, as evidenced by higher total ATPase and nicotinamide adenine dinucleotide kinase (NADK) activities, higher energy charge level, adenosine triphosphate (ATP) and adenosine diphosphate (ADP) contents, lower level of adenosine monophosphate (AMP) and transcript abundance of respiratory enzymes. These findings collectively suggest that melatonin maintains leaf quality of postharvest Chinese flowering cabbage might be, at least in part, due to the reduced ratio of Embden-Meyerhof-Parnas pathway (EMP), tricarboxylic acid (TCA) cycle, and cytochrome pathway (CCP), a relatively higher level of pentose phosphate pathway (PPP) and energy status.