Abstract

Our previous study indicated that nanocomposite packaging material (Nano-PM) containing nano-Ag, nano-TiO_2, nano-SiO_2 and nanoattapulgite alleviated postharvest senescence of *Flammulina velutipes* by regulating respiration and energy metabolism. In this study, extracellular ATP (eATP) and programmed cell death (PCD) were employed as critical factors to further investigate the senescence mechanism of postharvest *F. velutipes*. Results demonstrated that Nano-PM delayed apyrase activity decrease and stimulated critical oxidative phosphorylation-related gene expression to inhibit eATP content increase, which is a crucial signaling molecule related to delaying senescence. The regulation of eATP resulted in alleviating PCD including chromosomal concentration, DNA fragmentation, Ca^{2+} influx, high caspase-1 activity and cytochrome *c* content and leading to high cell viability. Overall, Nano-PM alleviated PCD and postharvest senescence of *F. velutipes* by regulating extracellular ATP.