Improving the biocontrol efficacy of *Meyerozyma guilliermondii* Y-1 with melatonin against postharvest gray mold in apple fruit

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Abstract

Apple gray mold caused by *Botrytis cinerea* can reduce postharvest shelf-life and quality of apple produce, and thus causes serious economic losses. In this study, we investigated the biocontrol efficacy of *Meyerozyma guilliermondii* Y-1 with and without its combination with melatonin (MLT) against *B. cinerea* in the postharvest apple fruit, and the underlying physiological and molecular mechanisms. Our results showed that the combination of *M. guilliermondii* Y-1 (1×10^8 cells/mL) and MLT (100 μmol/L) synergistically and significantly reduced the decay incidence and lesion diameter. MLT improved the ability of strain Y-1 to colonize in apple fruit wounds and surface whether at 22 or 4 °C. Moreover, *M. guilliermondii* Y-1 and MLT treatment markedly increased the defense-related enzyme activities, including catalase (CAT), superoxide dismutase (SOD), peroxidase (POD), phenylalanine ammonia-lyase (PAL), and polyphenol oxidase (PPO), as well as the total antioxidant capacity (T-AOC), total phenolics and lignin contents. As expected, the expression levels of four pathogenesis-related (*PR*) genes (*MdPR1*, *MdPR5*, *MdGLU*, and *MdCHI*) and two jasmonic acid (JA) signaling pathway related genes (*MdPDF1.2* and *MdCOI1*) were significantly increased in response to strain Y-1 and MLT treatment. Furthermore, the most pronounced and/or rapid increase was observed in the combined than individual treatments of either strain Y-1 or MLT. Our results suggest that the effective combination of strain Y-1 and MLT might be a reliable alternative against *B. cinerea* postharvest infection in apple fruit.