

Efficacy of epsilon-poly-L-lysine inhibition of postharvest blue mold in apples and potential mechanisms

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Abstract

Penicillium expansum is a major postharvest fungal pathogen and is the causal agent of blue mold decay in apples. Epsilon-poly-L-lysine (ϵ -PL) is a naturally-occurring polypeptide that has strong antimicrobial activity. It is primarily used to suppress foodborne pathogens in bread, beverage, meat products, *etc.* The potential application of ϵ -PL in the management of fungal postharvest diseases of fruit, however, has not been explored. In the present study, the inhibitory effect of ϵ -PL against blue mold (*P. expansum*) disease of apples and its potential mechanism of action were investigated. Results indicated that 600 mg L⁻¹ of ϵ -PL could effectively inhibit mycelial growth of *P. expansum* in apples. Concentrations of ϵ -PL > 200 mg L⁻¹ also inhibited germination of conidia and germ tube growth of *P. expansum* in potato dextrose broth (PDB). The inhibitory effect increased with increasing concentrations of ϵ -PL concentration. Further studies indicated that the possible mechanisms involved of ϵ -PL inhibition of *P. expansum* included the activation of defense-related enzyme activity and gene expression in apple fruit tissues. This included polyphenol oxidase (PPO), catalase (CAT), peroxidase (POD) and phenylalanine ammonia-lyase (PAL). ϵ -PL stimulated the production of intracellular reactive oxygen species (ROS) and degraded the integrity of the cell wall and plasma membrane of conidia, resulting in the death of conidial spores of *P. expansum* or their germination.