

Title Biological control agents and chemical inducers of resistance for postharvest control of *Penicillium expansum* Link. on apple fruit

Author Mara Quaglia, Luisa Ederli, Stefania Pasqualini and Antonio Zizzerini

Citation Postharvest Biology and Technology, Volume 59, Issue 3, March 2011, Pages 307-315

Keywords Bioagents; Biocontrol; Physical treatments; Postharvest decay; Salt ASM; BABA; *Malus domestica*; MeJA; Pathogenesis-related proteins; *Pseudomonas syringae* pv. *syringae*; *Trichoderma* spp

Abstract

Penicillium expansum Link. is the causal agent of apple blue mold, and it can cause severe loss of stored fruit. The use of fungicides is still the major means for postharvest control of this disease. In the present study, we investigated the effectiveness of biological control agents (BCAs) and/or induction of resistance for postharvest control of blue mold on apple (*Malus domestica* L. cv Golden Delicious). The BCAs and chemical inducers of resistance tested had direct effects against *P. expansum*, significantly reducing the percentages of infection and/or lesion sizes when applied directly against this pathogen. The antifungal activities of acibenzolar-S-methyl, β -aminobutyric acid and methyl jasmonate were also confirmed *in vitro* against *P. expansum* and *Trichoderma atroviride* P1. Treatments with BCAs and chemical inducers of resistance did not control infection on the untreated wounds that were made 1 cm from the original treated wounds. However, reverse-transcription PCR showed that treatments with *Pseudomonas syringae* pv. *syringae* 1,3S and acibenzolar-S-methyl induced significant increases in the levels of gene transcripts of the pathogenesis-related proteins PR-1a, PR-2, PR-5 and PR-8 in apple peel, as compared to controls. Moreover, immunoblotting showed an accumulation of PR-2 and PR-5 proteins in treated samples. These data indicate that these treatments trigger resistance responses in the apple fruit, although these responses do not limit the infection. Thus, biological control is confirmed as one of the most promising alternatives for postharvest control of blue mold on apple, while the induction of resistance does not appear to be a useful approach here.