

Biocontrol and the mechanisms of *Bacillus* sp. w176 against postharvest green mold in citrus

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Abstract

Green mold caused by *Penicillium digitatum* is a serious postharvest disease of citrus. In this study, we obtained a new strain with potent biocontrol activity to control green mold of citrus, and it was characterized as *Bacillus* sp. w176 by physiological, biochemical, and 16S rDNA analyses. Cell-free supernatant (CFS) of strain w176 in PDB culture was analyzed by Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS). There were more than four different groups of possible metabolites including macrolactin, bacillaene, mycosubtilin, and surfactin. Additionally, both *Bacillus* sp. w176 and its CFS could effectively reduce disease incidence and lesion diameter of green mold of citrus *in vivo*. *Bacillus* sp. w176 and its CFS reduced green mold by round percentage of 89.3% and 54.46%, respectively. Moreover, both *Bacillus* sp. w176 and its CFS could similarly inhibit the expansion of green mold on citrus with similar effect compared to the fungicide prochloraz after three months of storage. Transmission Electron Microscope (TEM) examination showed that subcellular structure of *P. digitatum* was changed involving vacuolation, when it was incubated with CFS. Gene expression analysis indicated a change in redox and ribosome biogenesis stress-related genes transcript levels, when *P. digitatum* were treated with CFS. These results suggested that both *Bacillus* sp. w176 and its CFS might be valuable for disease control purpose. Our study may provide a novel biological agent to control the citrus green mold and improve our understanding of the possible biocontrol mechanisms of strain w176.