

Biocontrol efficacy and possible mechanism of *Streptomyces* sp. H4 against postharvest anthracnose caused by *Colletotrichum fragariae* on strawberry fruit

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Postharvest Biology and Technology, Volume 175, May 2021, 111401

Abstract

Anthrachnose is a fungal disease caused by *Colletotrichum* species, which is detrimental to numerous fruits, including strawberry. Use of fungicides to maintain fruit quality leads to potential environmental pollution and health risk. Biocontrol using beneficial microorganisms such as *Streptomyces* has been applied successfully for controlling postharvest diseases of fruit. In this study, strain H4 with a high antifungal activity against *C. fragariae* was isolated from *Dichotella gemmacea* in Xisha islands of South China Sea. Combining the morphological and biochemical characteristics with the 16S *rRNA* sequence analysis, this strain was assigned as *Streptomyces* sp. A preventive treatment using strain H4 extracts significantly reduced severity and incidence of anthracnose disease and maintained fruit hardness and color on harvested strawberry fruits. A minimum inhibitory concentration (MIC) and a minimum fungicidal concentration (MFC) were $1.563 \times 10^{-3} \text{ g L}^{-1}$ and $3.125 \times 10^{-3} \text{ g L}^{-1}$, respectively. Extracts could effectively inhibit mycelial growth and spore germination of *C. fragariae* *in vitro*. The mycelial structure of pathogenic fungi showed deformation, shrinkage, collapse and tortuosity. A significant decrease in sugar and protein contents was also observed in treated *C. fragariae* mycelia. Fourteen chemical compounds were identified by gas chromatography-mass spectrometer (GC-MS). Dibutyl phthalate was the major constituent. Notably, strain H4 and its extracts exhibited a broad-spectrum antifungal activity against seven selected plant pathogenic fungi. Hence, *Streptomyces* sp. H4 and its metabolites have a high efficiency of antagonistic roles against phytopathogenic fungi diseases. It provides a promising biological agent to control anthracnose of strawberry fruit.