

Metabolomics analysis reveals that myrcene stimulates the spore germination of *Penicillium digitatum* via the upregulation of central carbon and energy metabolism

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Abstract

Tremendous economic losses in the citrus industry are caused by infestations of *Penicillium digitatum*. Previous research has shown that the terpene myrcene in citrus essential oils could stimulate the spore germination and mycelial growth of *P. digitatum*. However, the underlying mechanism is poorly known. Here, how myrcene induces the spore germination of *P. digitatum* was elucidated. The addition of myrcene significantly promoted the spore germination of *P. digitatum* and green mold in citrus fruit. As the incubation time increased, the intracellular and extracellular myrcene contents both significantly decreased in myrcene-treated samples, and no downstream products were detected through a Gas Chromatography-Mass Spectrometer. Metabolomics analysis revealed that the contents of metabolites involved in central carbon metabolism, such as glycolysis, pentose phosphate pathway, and citrate cycle, were significantly affected after the addition of myrcene. The adenosine triphosphate content and the intracellular energy charge were also drastically increased. Overall, our results suggest that the ability of myrcene to stimulate the spore germination of *P. digitatum* might be mediated by the upregulation of central carbon and energy metabolism.