SlMAPK3, a key mitogen-activated protein kinase, regulates the resistance of cherry tomato fruit to *Botrytis cinerea* induced by yeast cell wall and β-glucan

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Abstract

Induced disease resistance of fruit by bio-based compounds is a promising strategy to control fruit decay. This research was aimed at studying the resistance of cherry tomato fruit to *Botrytis cinerea* induced by the yeast cell wall component from *Saccharomyces cerevisiae* and investigate a role of MAPKs in regulating the resistance response. The disease resistance of cherry tomato fruit was effectively enhanced by yeast cell wall and β-glucan. The expression of *SlMAPK3* (but not of *SlMAPK1* and *SlMAPK2*) was significantly increased by yeast cell wall and β-glucan and reached peak at 1 h. The yeast cell wall component also induced high expression of PR genes (*SlPR1*, *SlPR5* and *SlCHI9*) and the transcription factors (*SlERF1* and *SlPti5*) that specifically bind to the promoter of PR genes. The expression of PR genes (*SlPR1*, *SlPR5* and *SlCHI9*) peaked after 24 h (at 24 or 48 h). The peak of *SlERF1* and *SlPti5* gene expression mostly appeared at around 4 h. It supposed to be a chronological order in the peaks of gene expression profile among *SlMAPK3*, PR genes and transcription factors. U0126 (1,4-diamino-2,3-dicyano-1,4-bis(o-amino-phenylmercapto)butadiene) significantly inhibited transcription of *SlMAPK3, PR* genes and transcription factors. The yeast cell wall and β-glucan could not induce high expression of *SlMAPK3* and the downstream genes of *SlMAPK3* in the U0126 treatment. These findings indicated that the yeast cell wall component that acts as microbe associated molecular patterns (MAMPs) could effectively induce disease resistance in cherry tomato fruit after harvest. The mechanism of induced resistance was associated with the expression of *SlMAPK3* and defense-related genes. *SlMAPK3*, as an important upstream signaling kinase, had a direct regulatory effect on the downstream transcriptional factors (*SlERF1* and *SlPti5*) to activate the expression of PR genes in the yeast cell wall component-induced immune responses in cherry tomato fruit.