Postharvest biological control of Rhizopus rot and the mechanisms involved in induced disease resistance of peaches by *Pichia membranefaciens*

Xiaoyun Zhang, Feng Wu, Ning Gu, Xueli Yan, Kaili Wang, Solairaj Dhanasekaran, Xiangyu Gu, Lina Zhao and Hongyin Zhang

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Abstract

Biological control of postharvest diseases of fruit by antagonistic yeast has been considered to be an effective and promising strategy to reduce the postharvest loss of fruits. In this study, the biocontrol efficacy of *Pichia membranefaciens* against Rhizopus rot of peaches was investigated. Also, the study was aimed to explore the mechanisms involved in the induced disease resistance of peaches by investigating the activities of defense-related enzymes and transcriptome analysis. The results indicated that *P. membranefaciens* had significant biocontrol efficacy against Rhizopus rot of peaches. The activities of defense-related enzymes including PPO, POD, PAL and CAT were potentially induced by this yeast. The transcriptome analysis revealed that MAPK cascade signaling pathway and signal transduction pathways of ethylene (ET), jasmonate (JA) and salicylic acid (SA) were triggered in peaches by *P. membranefaciens* to regulate the transcription factors (TFs). Then, these TFs further mediated the expression of downstream defense-related genes including PR genes (*PR1*, *CHI4* and *major allergen Pru ar 1*) and glutathione S-transferase (GST) genes (*MKP11.22* and *Atlg10370*), the genes classified into plant-pathogen interaction pathways (*CML48*, *MUK11.19* and *ROBHA*) and the genes involved in the synthesis of secondary metabolites (*GGPS*, *PKS5*, *CHS1*, *CYP75B2*, *DFR*, *LDOX*, *PAL*, *PNC1* and *ROMT*) to enhance the disease resistance potential of peaches. Besides, the accumulation of some antifungal compounds including flavonoids and lignin was stimulated to enhance the antifungal ability of peaches. Consequently, the present study contributes to understand the mechanisms behind the induced disease resistance of peaches by antagonistic yeast, and would provide new disease control strategy by improving the defense responses of fruit against pathogens.