

Publication

A remarkable synergistic effect at the transcriptomic level in peach fruits doubly infected by prunus necrotic ringspot virus and peach latent mosaic viroid

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Background: Microarray profiling is a powerful technique to investigate expression changes of large amounts of genes in response to specific environmental conditions. The majority of the studies investigating gene expression changes in virus-infected plants are limited to interactions between a virus and a model host plant, which usually is Arabidopsis thaliana or Nicotiana benthamiana. In the present work, we performed microarray profiling to explore changes in the expression profile of field-grown Prunus persica (peach) originating from Chile upon single and double infection with Prunus necrotic ringspot virus (PNRSV) and Peach latent mosaic viroid (PLMVd), worldwide natural pathogens of peach trees. Results: Upon single PLMVd or PNRSV infection, the number of statistically significant gene expression changes was relatively low. By contrast, doubly-infected fruits presented a high number of differentially regulated genes. Among these, down-regulated genes were prevalent. Functional categorization of the gene expression changes upon double PLMVd and PNRSV infection revealed protein modification and degradation as the functional category with the highest percentage of repressed genes whereas induced genes encoded mainly proteins related to phosphate, C-compound and carbohydrate metabolism and also protein modification. Overrepresentation analysis upon double infection with PLMVd and PNRSV revealed specific functional categories over- and underrepresented among the repressed genes indicating active counter-defense mechanisms of the pathogens during infection. Conclusions: Our results identify a novel synergistic effect of PLMVd and PNRSV on the transcriptome of peach fruits. We demonstrate that mixed infections, which occur frequently in field conditions, result in a more complex transcriptional response than that observed in single infections. Thus, our data demonstrate for the first time that the simultaneous infection of a viroid and a plant virus synergistically affect the host transcriptome in infected peach fruits. These field studies can help to fully understand plant-pathogen interactions and to develop appropriate crop protection strategies.

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