TRICHODERMA HARZIANUM T39 BIOCONTROL ACTIVITY AGAINST *PLASMOPARA VITICOLA*: ROLE OF PROTEIN PHOSPHORYLATION IN INITIATING GRAPEVINE RESISTANCE

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Several *Trichoderma* spp. are effective biocontrol agents against numerous pathogens. In grapevine, preventive applications of a commercial formulation of *Trichoderma harzianum* T39 has been shown to reduce downy mildew symptoms both locally and systemically, without negative effects on plant growth. We previously demonstrated that T39 induce plant resistance with a direct activation of the microbial recognition machinery after T39 treatment and the enhanced expression of defence-related processes after pathogen inoculation. In order to better characterize cellular processes associated to the early stages of T39-induced resistance, changes in protein phosphorylation activated by T39 have been analysed before and at 1 day post inoculation of *Plasmopara viticola* inoculation. Increasing evidence indicates that plant protein phosphorylation plays a pivotal role at different stages of plant response to pathogens activating a state of alert with low metabolic cost in plant. By combining a multi-dimensional strategy for phosphopeptides enrichment with the high-throughput eight-plex iTRAQ protocol, 161 proteins with at least one phosphorylation event were identified and quantified. Among them, different plasma membrane associated receptor kinases and proteins involved in signal cascade were differentially phosphorylated during T39-induced resistance, proving the importance of phosphorylation in resistance signal transduction. Moreover, the categories of secondary metabolic process (i.e. cell wall strengthening) and nucleic acid metabolic processes (chromatin and histone modification) were significantly overrepresented in T39-treated samples upon *P. viticola* infection.

All together, our results offer a better understanding of the mechanisms underlying the grapevine induced resistance and furnish knowledge to improve its efficacy. Indeed, new candidate proteins able to strengthening the plant's state of alert with low metabolic cost for the plant were identified and will be used for developing strategies for controlling downy mildew diseases.