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The role of thiamine (Vitamin B2) in the modulation of metabolism of the phenylpropanoid pathway in grapevine (*Vitis vinifera*) leading to enhanced resistance to *P. viticola*

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Recent reports suggest that vitamin B1 (thiamine) participates in the processes underlying plant adaptations to certain types of biotic stress. However, mechanisms underlying vitamin-induced, especially thiamine-induced, disease resistance are largely unknown. Here, we show the ability of thiamine to induce resistance against *Plasmopara viticola* in a susceptible grapevine cv. Chardonnay by a dual mode of action involving direct antifungal activity and elicitation of host-defense responses including H_2O_2 generation, upregulation of *PR* genes, and hypersensitive cell death. In addition, we assessed whether thiamine could modulate phenylpropanoid pathway-derived phytoalexins in grapevine plants, as well as, the role of such secondary metabolites in this induced resistance process to *P. viticola*. We found that thiamine treatment elicited the expression of the phenylpropanoid pathway genes in grapevines. The expression of these genes correlated with an accumulation of stilbenes, phenolic compounds, flavonoids including a quercetin 3-O-glucoside, and lignin. Furthermore, the total antioxidant potential of thiamine-treated plants was 3.5-fold that of control plants. Four phenolic compounds corresponded to 97% of the total antioxidant potential of thiamine-treated plants. Among them, caftaric acid, which belongs to the hydroxy-cinnamic acids family, corresponded to 20% of the total antioxidant potential. Epifluorescence microscopic analysis revealed a concomitant presence of unbranched and altered pathogen mycelia and stilbenes production in the leaf mesophyll of thiamine-treated plants, suggesting a possible contribution of this phytoalexin family in thiamine-induced resistance to *P. viticola* in grapevine.

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