Studies on biological mechanisms of *Trichoderma* spp. and *Bacillus subtilis* in reducing grapevine downy mildew

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The downy mildew historically appears as one of the most constraints to productivity in vineyards. In southern Brazil, farmers use a calendar schedules to spray copper fungicides, mancozeb+metalaxyl or phosphonate formulations to protect grapevine from *Plasmopara viticola*. Those calendars are use in almost all phonological stages of plant development. However, in recent years, bunches or soil have displaying increasingly levels of pesticide residues, threatening the food safety. In this context, technicians search for alternatives to pesticides, and one choice has been the use of biological control agents. For this purpose, this work tried to evidence systemic acquired resistance (SAR) or antimicrobial activities, when commercial substances based on *Trichoderma* spp. (Ecotrich® and Quality®, 0.2 and) and *Bacillus subtillis* (Serenade®) were respectively exposed to 'Cabernet-Sauvignon' grapevine leaves (host) or *Plasmopora viticola* sporangia, the downy mildew pathogen. Two greenhouse trials were design in order to assess protective and curative activities of the experienced microorganisms. Measures regarding antimicrobial activity were performed by in vitro viability sporangia assays. As resistance inducers, biological agents did promote discrete AUDPC decreases and non-significant % of protection, when compared with non-treated controls. The substances induced small variations on activities of major PR-proteins, guaiacol peroxidases (GPX), β-1,3-glucanases (GLU), chitinases (CHI) and diphenolases (PPO) at 12-72 hour after sprayings (HAS). In treated leaves, it was observed increases on total phenolic and lignin content, but they did not significantly differ from the controls. Regarding antimicrobial trials, it was evidenced no significant differences between biological substances and water, when added to a 5 x 10^5 sporangia mL^{-1} suspension. By these results, it is hypothesized that the biological agents could to give a stronger antimicrobial protection to grapevine only when they live together with the pathogens, at a phylloplane level.

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