

Induction of grapevine defense systems using the oomycete *Pythium oligandrum* against a pathogenic fungus involved in Esca

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The oomycete, *Pythium oligandrum*, has been reported to control several diseases and is able to induce plant defense systems. In order to control grapevine diseases, we isolated *P. oligandrum* strains from the rhizosphere of vines cultivated in 12 vineyards of the Bordeaux region. *Pythium* spp. with echinulated-oospores were frequently isolated from the root system of the sampled vines, with *P. oligandrum* being the most frequently identified species (91% of strains, analyses based on ITS region). Strains from this oomycete were used to control a fungus involved in esca, *Phaeomoniella chlamydospora*, in a greenhouse assay conducted in 2010, 2011 and 2013. In comparison with control plants infected with the pathogen, necroses were half-reduced when *P. oligandrum* colonized the root system of the Cabernet Sauvignon cuttings. Genes involved in various grapevine defense pathways were studied to determine plant responses after inoculation by *P. oligandrum* and/or *P. chlamydospora*. In the trunk, when *P. oligandrum* colonized the roots, infection with *P. chlamydospora* was associated with a quicker and a more intense up-regulation of the 22 studied genes. Interestingly, 7 days post inoculation, genes up-regulations were observed in the biosynthetic pathway of phenylpropanoids (6 genes studied), indoles (2 genes), and cell wall synthesis (3 genes). However, when the plants were infected with *P. chlamydospora* alone, the grapevine defense responses were different: only some specific Pathogenesis-Related proteins were stimulated 14 days post inoculation. Priming is probably induced by *P. oligandrum* and we are currently using *Vitis vinifera* micro-arrays to investigate this finding.