Study of the effect of native vineyard bacteria on the expression of *Plasmopara viticola* effectors

Camilla Mandorino[1,2*], Antonella Salerno[1,4], Annalisa Prencipe[2], Marco Vendemia[1], Flavia Angela Maria Maggiolini[1], Maria Francesca Cardone[1], Andreia Figueiredo[3], Antonio Domenico Marsico[1], Carlo Pazzani[2]

[1] *CREA - Viticulture and Enology, Turi, Italy*
[2] *Department of Biosciences, Biotechnology and Environment, University of Bari "A. Moro", Bari, Italy*
[3] *Biosystems and Integrative Sciences Institute (BioISI), Plant Biology Department, Science Faculty of Lisbon University, Lisbon, Portugal*
[4] *Department of Soil, Plant and Food Science, University of Bari "A. Moro", Bari, Italy*

[*] *Corresponding author: camilla.mandorino@uniba.it**

Abstract

Downy mildew, caused by the oomycete *Plasmopara viticola* (Berk. & M.A. Curtis) Berl. & De Toni, is one of the most destructive grapevine diseases mostly affecting *Vitis vinifera* L. and impacting on viticulture. The pathogen invasion can induce in grapevine multiple defense reactions, first PAMP-Triggered Immunity and secondly Effector-Triggered Immunity. *Plasmopara viticola* can overcome these defense mechanisms through the secretion of effectors, such as RxLR, into the plant cells, making it easier for the oomycete to infect grapevines. Currently, the use of chemical pesticides remains the most effective way to control the pathogen with severe negative side effects on the environment and animal health. Consequently, great attention has been recently paid to identifying new Biological Control Agents (BCAs). At CREA Viticulture and Enology, 47 bacterial isolates were collected from the leaves of three *Vitis vinifera* cultivars, Blush, Dawn seedless and Argentina, showing different degrees of tolerance to *Plasmopara viticola*. Three of the collected bacteria, that previous tests suggested as potentially good *Plasmopara viticola* antagonists, were sprayed on Cabernet sauvignon leaves at 10^7 CFU ml^{-1} 48 hours before leaf infection with *Plasmopara viticola* at 10^6 sporangia ml^{-1}. A gene expression analysis of *Plasmopara viticola* effectors PvRxLR28 and PvRxLR67, performed through quantitative PCR, revealed an impairment in the expression levels of the two genes in treated leaves compared with control leaves. These results suggest these bacteria as potential BCAs against *Plasmopara viticola*. Further transcriptomic analysis will be performed to investigate bacterial effects on the expression of multiple *Plasmopara viticola* pathogenicity genes.

Keywords: native vineyard bacteria, biological control agents, *Plasmopara viticola*, *Vitis vinifera*, RxLR effectors