ABSTRACTS

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A COMPLEX PROTEIN DERIVATIVE ACTS AS BIOGENIC ELICITOR OF GRAPEVINE RESISTANCE AGAINST POWDERY AND DOWNY MILDEWS

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Powdery (*Erysiphe necator*) and downy (*Plasmopara viticola*) mildew are important grapevine diseases worldwide. They require frequent application of synthetic chemical fungicides to be controlled at satisfactory levels. Concerns on the negative impact of synthetic fungicides on human health and environment have raised interest in complementary/alternative eco-friendly solutions. Induction of grapevine resistance is an encouraging alternative, although the full potential of resistance inducers has yet to be recognized. Our aim was to develop new methods for powdery and downy mildew control in grapevine based on a better understanding of biocontrol properties of a specific protein derivative (nutrient broth, NB). Preventive treatments with the protein derivative NB significantly reduced powdery and downy mildew symptoms under greenhouse conditions. Under field conditions, NB reduced powdery mildew infections during three consecutive years with different levels of disease pressure, and limited downy mildew infections at the beginning of the season in cases of low infection pressure. NB does not show any direct toxic effect against *E. necator* conidia, and only a slight inhibition of *P. viticola* sporangia germination, suggesting more complex biocontrol mechanism. Gene expression analysis showed that NB induced the expression of defence-related genes encoding pathogenesis-related (PR) proteins before pathogen inoculation. Moreover, the expression of PR genes was higher in NB-treated than in control plants at one day post inoculation with *E. necator* and *P. viticola*, indicating direct stimulation of grapevine defences that may limit pathogen growth at early stages of infection.
Since NB is used as growth medium for culturing microorganisms and may have an impact on shaping phyllo sphere microbial populations, microorganisms of grapevine leaves treated with NB under greenhouse conditions were analysed by a metagenomic approach. As expected NB increased the number of culturable bacteria on the phyllo sphere and modified the abundances of some bacterial and fungal taxa that are related to possible biocontrol properties. In this way, the NB-stimulated microorganisms may compete for space, contribute to resistance induction and reduce the pathogen infection.
Although our study showed that the efficacy of NB in controlling grapevine downy and powdery mildew is based mainly on direct induction of grapevine resistance, NB partially influences the composition of leaf microbial populations and promotes some putative biocontrol agents. Based on its relatively low cost and absence of any toxicological concern for humans it may offer an additional tool to reduce susceptibility of grapevine against its key diseases.

Key words: Complex protein derivative, elicitor, grapevine resistance, phyllo sphere populations