# The differences in resistance levels of different FRCs and the impact of their deployment on fungicide use in viticulture

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## Abstract

European grapevine cultivars (Vitis vinifera spp.) are highly susceptible to the downy mildew pathogen Plasmopara viticola. To reduce the dependence of viticulture on chemical inputs, and thereby reduce the ecological and economic burden of wine production, a number of breeding programs have introgressed resistance loci from wild North American and Asian Vitis species into V. vinifera resulting in new fungus-resistant grapevine cultivars (FRCs). These FRCs are a promising strategy to reduce the impact of disease management. Due to variety-specific resistance differences, little is known about the required amount and the potential reduction of fungicide applications.

The aim of the project was to investigate the degree of resistance of new FRCs and thus the capability of fungicide reduction in the vineyard over a 6 year time period. For this purpose, the infection and sporulation ability as well as the development of P. viticola in different FRCs and susceptible cultivars were investigated and compared. Additionally, FRCs with reduced plant protection treatments were compared to traditional cultivars. On the basis of the results obtained, adjusted plant protection recommendations for FRCs were developed.

The on-farm experiments showed that the use of FRCs in combination with reduced plant protection management strategies offers the possibilities to significantly reduce the number of fungicide treatments required for grape production. Results obtained from this study demonstrated that the deployment of FRCs can save 50–85 % of fungicide applications in viticulture depending on the degree of the vairiety´s resistance level. The omission of all plant protection applications can ultimately lead to negative effects on yield, quality and even resistance durability. The latter was demonstrated by the identification of new P. viticola isolates capable of overcoming *Rpv3*- and *Rpv12*-mediated resistance. Therefore, this study demonstrates the importance of sustainable breeding and crop protection strategies.

**Keywords:** Disease resistance, Downy mildew, Fungus-resistant grapevine cultivars, Grapevine, *Vitis vinifera*, *Plasmopara viticola*