Grapevine fanleaf disease: simple solution for complex problem?

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Abstract

Grapevine fanleaf disease, caused by grapevine fanleaf virus (GFLV) and transmitted by the soil-borne nematode *Xiphinema index*, is the most detrimental of the grapevine viral diseases. It provokes severe symptoms and economic losses, threatening vineyards worldwide. Many strategies of control based on prophylaxis, biotechnology, biocontrol have been explored. So far, no effective and environmentally friendly solution has been reached. Natural resistance to GFLV has equally been examined but, in the most comprehensive screening study, none of the tested accessions were found to be resistant. As recessive genetic determinisms have often been described for plant virus resistance, the challenges of finding a source of natural resistance to GFLV may be explained by the high rate of heterozygosity in grapevine.

We investigated the presence of recessive resistance to GFLV in grapevine genetic resources through the screening of the progenies from self-fertilization of various varieties and species. We discovered that the Riesling variety displays resistance to GFLV, although it is susceptible to *X. index*. This resistance is determined by a single recessive factor located on grapevine chromosome 1, which we have named *resistance to grapevine fanleaf virus 1* (*rgflv1*). *rgflv1* is located in a 5.7 cM interval which represents a physical distance of ~1.1 Mb. Analysis of recombinant allowed us to narrow the interval to a region of 600 kb encompassing 57 genes.

To our knowledge, this is the first and only instance of resistance to grapevine fanleaf virus identified in grapevine so far. This finding represents strong basement to go further in the identification and the characterization of the gene underlying the *rgflv1* resistance locus. In terms of innovation, it paves the way for the design of new ideotypes of multi-resistant grape varieties that combine resistance to root and aerial major diseases.

Keywords: grapevine fanleaf virus, resistance, recessive gene, Riesling