Physiological means to curb the enthusiasm of viruses from infecting grapevines

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Abstract

The two most deadly viruses infecting and threatening the productivity of grapevines worldwide are leafroll and red blotch viruses. There is no cure for viral diseases other than roguing the symptomatic vines and replacing them with certified vines derived from clean, virus-tested stocks. Given that phloem plays a central role in virus infection, this study aimed to purge the virus by girdling the phloem of leafroll-infected vines at different phenological stages of infected grapevines. Phloem-girdling was performed on canes at veraison to varying regions between the proximal and distal clusters. The vines responded to gridling by forming a callus to bridge the gap and restore vascular functionality. The whole lamina of the leaves above the girdled region turned red due to anthocyanin accumulation triggered by sugars confined to the leaf. This reddening was quite different from the reddening that typically occurs in the leafroll-infected vines, wherein the whole lamina turned red except for the lamina close to the major and minor veins, giving the impression of green veins. The girdled canes showed a low virus concentration compared to the ungirdled canes. Also, the primary metabolites, such as sugars, acids, and nitrogenous compounds, and the secondary metabolites, such as flavanols (tannins), flavonols, and anthocyanins desired for making wine did not vary much between the girdled and ungirdled shoots. This study showed that by girdling the phloem over several growing seasons can reduce the virus load in the infected vines, restoring the vine's health.

Keywords: Acids, Anthocyanins, callus, girdling, phenolics, phloem, sugars.