Virus monitoring in grapevine genetic resources

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Virus infections in viticulture have a negative impact on the physiology of the vines. They cause losses in grape quality and yield and consequently economic losses.

For the maintenance of genetic resources in *ex situ* collections virus infections are an increasing threat, too. As there are no effective curative methods to eliminate viruses in the vineyard, their spread currently can only be limited by monitoring the disease based on laboratory tests and by replacing infected vines by healthy plants.

Virus detection is mostly based on ELISA (Enzyme-linked Immunosorbent Assay) or PCR (polymerase chain reaction) techniques, which are cost and time intensive. Non-invasive methods using sensors shall enable faster and a more cost-effective monitoring in the future.

Sensors such as hyperspectral sensors offer the possibilities to describe the plant physiology and monitor virus infections (Bendel et al. 2020). However, to set up the system reference methods such as PCR or ELISA are still necessary to establish the baselines for a sensor-based monitoring. Three RNA-viruses (Grapevine leaf roll as-associated virus- 1 and -3 (GLRaV-1 and GLRaV -3) and Grapevine Pinot Gris Virus (GPGV)) are of major importance in our investigation, which are detected by a reverse transcriptase reaction followed by multiplex-PCR.

At JKI Geilweilerhof genetic resources are organized in different thematic collections: e.g. table grapes, international *Vitis vinifera* cultivars, so called historical varieties and interspecific genotypes. Based on a previous study (Bendel et al. 2020), in a first step a targeted virus screening could be performed, to identify virus infected plants for future sensor analyses.

In the present investigation we considered (1) four varieties (Aligote, Dolcetto, Riesling and Regent) of the international cultivars and (2) 17 varieties from the *Vitis vinifera* collection. To establish a reference method, two PCR studies with wood samples from 150 grapevine plants and approx. 1000 PCR reactions were carried out.

Study 1 showed a virus infection rate of 23% of the plants and study 2 revealed an infection rate of close to 100%. Simple and multiple virus infections were observed. The 150 infected and non-infected plants are a very good training set for sensor validation analyses. For that purpose within the next weeks spectral sensor data will be recorded and tested for correlation with data obtained by the reference method.