



Master internship at Agroscope

Titre

Exploration of the virome of fungal endophytic communities in grapevines

Introduction

The development of new sequencing methodologies has revealed the presence of a wide diversity of viruses in all the environments studied. However, important variations are observed according to environmental constraints. Thus, in a defined pedoclimatic environment, the study of plant viroma shows that the biodiversity of phytoviruses is significantly higher when the plot is cultivated compared to a plot left in the wild (Bernardo et al. 2017).

In the framework of a work initiated in March 2019 and which continues in the form of a PhD thesis since March 2020, Agroscope's virology and mycology groups are joining forces to evaluate the role of anthropization on the virome of fungal endophytic communities in grapevines of the Visperterminen vineyard in Upper Valais, known to be the highest vineyard in Europe. Thanks to an ancestral method of cultivation, grapevines of *Vitis vinifera* cv. Savagnin blanc of more than 100 years old rub shoulders with young grapevines that are regularly renewed according to the most recent cultivation methods.

The results of our work show that the composition of fungal endophytic communities is greatly influenced by the replacement and regular maintenance of the grapevines. In line with these promising results, work is in progress to evaluate the biodiversity of fungal viruses (mycoviruses) in fungal endophytic communities derived from welded/grafted grapevines that are strongly influenced by human intervention in comparison with the biodiversity of mycoviruses in fungal endophytic communities derived from very old vines worked according to ancestral methods. Similar results previously obtained in Agroscope's mycology group also showed that phytosanitary treatments applied to vine plants significantly affect the composition of fungal communities.

We want to complete our analysis of the biodiversity of mycoviruses with the analysis of fungal communities derived from grapevine plants that have undergone phytosanitary treatments. The internship that we propose at Agroscope is associated with the current thesis project and will benefit from its very good scientific and technical dynamics. It will allow us to verify whether the application of a phytosanitary stress on fungal communities favours or disadvantages the diversity of mycoviruses present in the fungal strains.

The master's internship will start in the 1st semester of 2021 with the harvest of the grapevine shoots in the Visperterminen vineyard. This internship will be an opportunity to develop practical skills for the extraction of fungal DNA and viral RNA from complex matrices as well as practical skills in qPCR. The student will develop bioinformatics skills for sequence analysis and primer/probe design for screening and quantification of viral genomic fragments in fungal isolates. Phylogenetic analyses of fungal strains and mycoviruses are also planned. Depending on the progress of the project, the reconstruction of complete viral genomes by RACE-PCR and the analysis of Illumina and/or nanopore sequencing data is planned.

The internship will be supervised by a team of 4 people including 2 scientists from the mycology group, the PhD student involved in the project and a scientist from the virology group.

Indicative bibliography

- Bernardo P, Charles-Dominique T, Barakat M, Ortet P, Fernandez E, Filloux D, et al. (2017) Geometagenomics illuminates the impact of agriculture on the distribution and prevalence of plant viruses at the ecosystem scale. *The ISME Journal* 12: 173. doi:10.1038/ismej.2017.155
- Ma Y, Marais A, Lefebvre M, Theil S, Svanella-Dumas L, Faure C, et al. (2019) Phytoviroome Analysis of Wild Plant Populations: Comparison of Double-Stranded RNA and Virion-Associated Nucleic Acid Metagenomic Approaches. *J Virol* 94(1)
- Marquez LM, Redman RS, Rodriguez RJ, & Roossinck MJ (2007) A virus in a fungus in a plant: Three-way symbiosis required for thermal tolerance. *Science* 315(5811): 513-515



Information about Agroscope

Agroscope is an innovative research institute for agriculture and nutrition. Agroscope is part of the federal administration and is attached to the Federal Department of Economic Affairs, Education and Research EAER. It has research stations at a number of sites around Switzerland.

We offer a stimulating work environment in a multidisciplinary research team as well as a close support throughout the project. Agroscope has excellent research facilities with well-equipped laboratories, greenhouses, climate chambers and sites for field experiments and field studies.

Place of Work

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Application

If this challenge appeals to you we look forward to receiving your e-mail application to olivier.schumpp@agroscope.admin.ch .

For further information, please feel free to contact Dr. Olivier Schumpp, phone +41 58 460 43 71, olivier.schumpp@agroscope.admin.ch or Dr. Katia Gindro, phone +41 58 465 43 74, katia.gindro@agroscope.admin.ch (