Identifying physiological and genetic bases of grapevine adaptation to climate change with maintained quality: Genome diversity as a driver for phenotypic plasticity ('PlastiVigne' project)

Dominique This [1], Roberto Bacilieri[1], Eva Coindre[1,4], Olivia di Valentin[2], Baptiste Pierre[1], Flora Tavernier[1], Thomas Baerenzung dit Baron [3], Gautier Sarah[1], Vincent Segura [1], Agnès Doligez[1], Charles Romieu[1], Thierry Lacombe[1], Sylvain Santoni[1], Christine Tollon-Cordet[1], Audrey Weber[1], Aude Coupel-Ledru [4], Thierry Simonneau[4], Benoit Pallas[4], Gaelle Rolland[4], Stéphane Berthezène[4], Romain Boulord[4], Julien Pirrello[2], Farid Regad[2], Olivier Geffroy [3], Olivier Rodrigues[3], Aurélie Roland[5], Somaya Sachot[5], Nicolas Saurin[6], Emmanuelle Garcia-Adrados[6], Cécile Marchal[7], Sandrine Dedet[7], Anne Mocoeur[7], Alban Jacques[3], Patrice This[1*]

[1] AGAP Institute, Univ Montpellier - CIRAD - INRAE, Institut Agro, F-34398 Montpellier, France
[2] LRSV, Université de Toulouse - INP - Purpan, 31076 Toulouse, France
[3] PPGV, Université de Toulouse -, INP - Purpan, 31076 Toulouse, France
[4] LEPSE, Univ Montpellier - INRAE - Institut Agro, Montpellier, France
[5] SPO, INRAE - Institut Agro -University Montpellier, 34060 Montpellier, France
[6] Domaine de Pech Rouge, Univ Montpellier - INRAE, F-11430 Gruissan, France
[7] Domaine de Vassal, INRAe, route de Sète, 34340 Marseillan, France

**Corresponding author : patrice.this@inrae.fr*

Abstract

In the face of climate change, new grapevine varieties will have to show an adaptive phenotypic plasticity to maintain production with erratic water resources, and still ensure the quality of the final product. Their selection requires a better knowledge of the genetic basis of those traits and of the elementary processes involved in their variability. 'PlastiVigne', an emblematic project of the Vinid'Occ key challenge, funded by the Occitanie Region (France), tackles this issue with innovative genomic and physiological tools implemented on a unique panel of grape genetic resources representing the genetic diversity of *Vitis vinifera*. A graph-pangenome is developed from a representative set of high-quality genomes to study the extent and impact of structural genome variations and chromosomal rearrangements in the rapid adaptation capacity of grapevine. We will characterize structural variants potentially related to differential expression or alternative spicing of candidate genes for stress tolerance in individual grape berries. Markers derived from structural variants mapped on the pangenome, as well as new sets of SNP markers, will allow the identification of genomic regions associated to leaf water and carbon balance under several water stress regimes, its plasticity, adaptation traits like phenology, genomic vulnerability, and to some traits related to the aromatic potential of grape berries. They represent new tools for grape breeding. More detailed functional analysis of leaf and berry phenotypic plasticity in response to water deficit will be then conducted, on a subset of contrasted varieties. We will present the project strategy and highlight a few preliminary results.

Keywords: Vitis vinifera, plasticity, pangenome, water/carbon balance, aroma