

## **Château La Tour Carnet : A unique in-field experiment to assess the potential suitability of 21 grapevine varieties in the Bordeaux winegrowing region in a context of global warming.**

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### **Abstract**

The impact of climate change on grapevine physiology has been extensively studied during the last decades. These studies highlight major changes to come not only on wine typicity but also on climate suitability for viticulture across all wine regions. Adaptation strategies such as changes in viticultural practices and in plant material selection have the potential to mitigate some of the effects of climate change. A unique in-field experiment conducted in Château La Tour Carnet (Bordeaux, France), aims at simulating the future phenology of 21 varieties through the use of heating wires to significantly increase the temperature of the bud microclimate. An extensive analysis of the agronomical (phenology and diseases assessment) and oenological performances (wine chemical and sensory analyses) of the treated vines will determine if traditional Bordeaux varieties will remain suitable for producing typical Bordeaux wine in a context of global warming. Potentially, new grape varieties could be identified to produce the so-called Bordeaux wine style under warmer conditions.

**Keywords** : Climate change, adaptation, wine typicity, plant material



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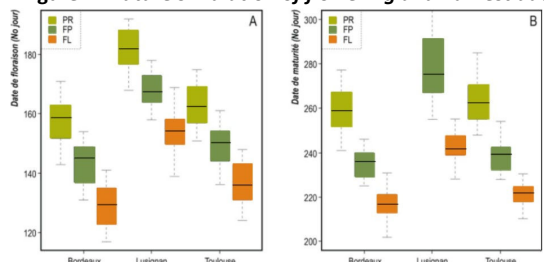
## Abstract

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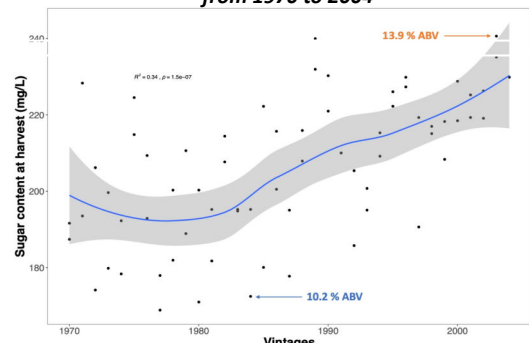
## Climate change impacts terroir typicity

Figure 1 : Future simulation of flowering and harvest dates



Average flowering (A) and harvest (B) dates for the Merlot variety is expected to constantly get earlier. Those stages are calculated for recent past (PR), near future (FP) and remote future (FL) in Bordeaux, Lusignan and Toulouse. (Pieri, 2010 ; Ollat et al., 2013)

Figure 2 : Sugar content at harvest in Pauillac from 1970 to 2004

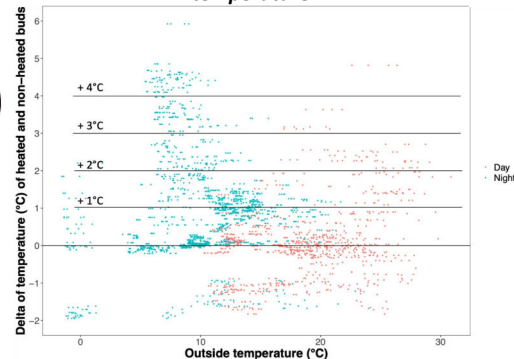


The constant increase in berry sugar content in Bordeaux since the 1970's (Chevet et Soyer, 2009) leads to higher alcohol wines, altering the terroir typicity. The recent vintages seem to demonstrate that some Bordeaux varieties may soon reach a tipping point.

## How can we assess the suitability of 21 potential varieties ?

In 2022, a unique in-field experiment was settled in Château La Tour Carnet. Using frost protection wires, grapevines buds are heated to stimulate future growing conditions on 21 varieties. By monitoring the agronomical and oenological behavior, we aim to isolate some suitable varieties to preserve the terroir typicity despite warmer conditions.

Figure 3 : Difference of temperatures between heated and non-heated buds and the impact of the environment temperature



The wires warm up the buds microclimates from 1 to 4 degrees. Our first trials showed the importance of using them at night to have a greater impact.

Figure 4 : The experimental vineyard



On the south plot, 21 varieties were selected for this experiment. Among them, the 6 Bordeaux varieties are tested to assess their potential adaptation to climate change. The 15 others varieties are considered as good candidates in the Bordeaux wine region.

## Phenotyping of 84 cultivars

Figure 5 : Budburst of 74 phenotypes in 2022

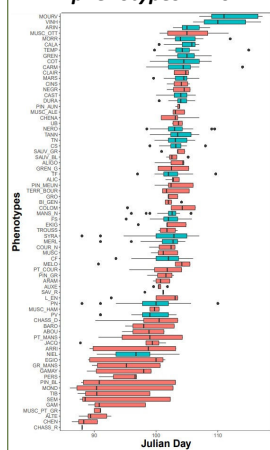


Figure 6 : A specific winery



In parallel of this experiment, the Château La Tour Carnet owns the world largest private collection of grapevine varieties. 80 phenotypes of *Vitis vinifera* from all wine regions around the world and 4 resistant varieties were planted over the last 10 years. Agronomical data (phenology, diseases,  $\delta^{13}C$ ,...) are collected to phenotype each one of them. All varieties are separately vinified in thermo-regulated stainless steel tank for future sensorial and chemical analyses of the finished wines.

## Conclusion

In the context of climate change with strong impacts on wine typicity, the study of potential new suitable varieties in Bordeaux has become key in research for preserving terroir expression.

Our unique in-field experiment aims to assess if Bordeaux varieties will still be suitable in warmer conditions. We also try to assess if other phenotypes could be selected to help winegrowers in preserving the Bordeaux wine typicity. In this experiment, agronomical and oenological results are considered to provide a full knowledge of those potential varieties.

Alongside this experiment, agronomical (diseases sensibility, phenology,  $\delta^{13}C$ ,...) and oenological (sensory and chemical compounds analyses) characterisation of 84 phenotypes will increase our current knowledge of a large pool of cultivars.

References :  
 • Pieri P. (2010). Changement climatique et culture de la vigne: l'essentiel des impacts. In Ademe, ed. Changement climatique, agriculture et forêt en France: simulations d'impacts sur les principales espèces. Le Livre Vert du projet CLIMATOR (2007-2010), pp 213-223  
 • Chevet, J.-M., & Soyer, J.-P. (2009). Phenologie et climat dans le Haut-Médoc (1800-2005) (Résultat préliminaire)