Dormancy conundrum: thermal requirements plasticity to reach budburst may be explained by annual environmental dynamics

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Abstract

Deciphering grapevine dormancy is crucial in the current context of climatic challenges: advancing budburst phenology and increased late frost probabilities, observed in the last decades and expected to further increase, require deeper understanding. Beyond higher mean temperatures, abiotic stresses such as water deficit have also been emphasized as actors. In this framework, we aimed at exploring new methodologies for tracking dormancy cycle and testing the interplay on its regulation of temperature dynamics and drought.

In a first experiment, twenty-one *Vitis vinifera* varieties were monitored during ecodormancy and budburst over three years. The dataset, consisting of BBCH scale values, growing degree days (GDD) accumulation, and quantum yield of dark-adapted photosystem II (F_v/F_m) of bud sections, allowed us to identify non-linear associations of F_v/F_m ratio with early phenology and GDD_6. Therefore, we propose it as a quantitative and reliable tool for further analyses.

In a second experiment, Chardonnay plants underwent water deficit stress or full-field capacity irrigation throughout the season. In addition to the methods described above, by sampling nodes at different timepoints during dormancy and exposing them to budbreak-forcing conditions, we tracked dormancy phases and their relationship with water deficit stress, acclimation and deacclimation dynamics.

Annual climate and dormancy cycle exhibit profound interdependence: oscillating temperature trends and stresses combinations lead grapevines to a plastic and varietal-specific response, possibly influenced by these same factors in several previous years.

The above findings and their underlying physiological mechanisms will be presented and discussed.

Keywords: Grapevine, dormancy, late frost risk, drought, chlorophyll fluorescence.