The adaptation and resilience of scions and rootstocks to water constraint

Melané A Vivier*, Riyana Diljee, Nomfundo Shange, Anscha Zietsman, Reinhard Swart, Talitha Venter, Carlos Poblete-Echeverria, Philip R Young, Mathabatha Evodia Setati

South African Grape and Wine Research Institute (SAGWRI), Faculty of AgriSciences, Stellenbosch University, Matieland 7602, South Africa

Corresponding author: mav@sun.ac.za

Abstract

The ability of grapevine cultivars and rootstocks to cope with and adapt to recurring water constraints is the focus of this study. The contribution of intrinsic (epigenetic) and extrinsic (rootzone microbial community) factors to water stress resilience will be discussed. The study was conducted in a validated model vineyard where three scion cultivars (Pinotage, Shiraz, and Cabernet Sauvignon) on two rootstocks (Richter 110 and USVIT8-7) grow under recurring seasonal water constraint (and control) scenarios since planting (in 2020). Comprehensive profiling of the site, soil, atmospheric conditions, plants, and their physiological responses provide contextual data for the analyses conducted. Sampling occurred twice in a season, firstly when no water constraint was evident yet (in that season), or after a period of confirmed water stress. For the epigenetic analyses, an initial baseline methylation analysis was performed, indicating that the %methylation drops towards the second time point (as water constraint developed). A more detailed analysis followed to also test for developmental patterns and to identify target plants for a deeper epigenetic analysis. The soil microbial community analysis showed that the rootstock-scion combinations significantly influenced fungal communities in terms of the level of diversity and community composition and structure, while sampling time points contributed significantly to differences in the bacterial community diversity. Clear alterations were observed in the vineyard microbiome with increasing water constraints. The combined data provides insight into the adaptability of grapevines and confirms the value of long-term experimentation and a high level of characterisation of complex field phenotyping sites in grapevine.

Keywords: Scion, Rootstock, Water stress, Epigenetics; Grapevine Microbiome.