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THE MICROVINE: AN ECOPHYSIOLOGICAL MODEL FOR GRAPEVINE

Nathalie LUCHAIRE[1], Mark RIENTH[2,3], Laurent. TORREGROSA[2], Charles ROMIEU[2], A. PELLEGRINO[1*]

[1]*UMR LEPSE, 2 Place Viala, F-34060 Montpellier, France*
[2]*UMR AGAP,2 Place Viala, F-34060 Montpellier, France*
[3]*Fondation Jean Poupelain - Javrezac, France*

*Corresponding author:*pellegan@supagro.inra.fr*

Abstract

Context and purpose of the study - Microvine is a natural mutant of grapevine characterized by a dwarf, rapid cycling and continuous flowering phenotype. Thanks to both its compacted architecture and the continuous flowering, new insights into grapevine yield and quality responses to climate changes are expected using this material. However, little is known regarding the main patterns of microvine growth and development, and how they differ from classical genotypes. The present study was aimed at quantifying key vegetative and reproductive characters of a reference microvine line (ML1) together with the cv. Grenache N., and at comparing the spatial and temporal growth patterns displayed by the ML1 microvine.

Material and methods - Potted plants of ML1 and Grenache N. were grown outdoorin 2009 and in greenhouse in 2011 and 2012, at max ETP (evapotranspiration). Vegetative and reproductive organogenesis were monitored twice a week. Leaf and berry growth were recorded twice a week. Berry fresh weight and total soluble solids were determined for all stages of berry development at once when basal bunches reached ripe stage (i.e. 20-22° Brix).

Results - Shorter internodes and smaller leaf area were observed in L1 compared with Grenache N. Along the axis, L1 continuously held inflorescences instead of tendrils. Flowers and berries number per inflorescence were lower in L1 than in Grenache N., and flower or berry abortion was nearly zero in L1. In spite of these differences, phyllochrons and leaf expansion duration after leaf emergence were similar for both materials. Moreover, maximal berry diameter and fresh weight were close for the two genotypes. A phenological model simulating leaf and berry key developmental phases was parameterized for L1. The model was used to convert spatial leaf and berry growth dynamics along the axis into temporal dynamics, which were compared to temporal dynamics at a given phytomer rank. The good match between the two patterns indicated the temporal changes can be inferred from spatial patterns. These results open new fields in grapevine studies. Short term experiment can now be designed under fully controlled environments using microvine in order to quantify the impact of abiotic stresses on a variety of traits underlying yield or berry quality simultaneously.

Keywords: Grapevine, Microvine, Growth, Organogenesis, Developmental pattern, Spacio-temporal gradient.