From soil to canopy, the diversity of adaptation strategies to abiotic constraints in grapevine

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Abstract (250 words)

Climate change is here. One of the main consequences is an increase in the frequency and severity of abiotic stresses which mostly occur in a combined manner. Grapevine, which grows in a large diversity of pedo-climatic conditions, has presumably evolved different mechanisms to allow this widespread adaptation. Harnessing the genetic diversity in these mechanisms will be central to the future of viticulture in many traditional wine growing areas. The interactions between the scion and the rootstock through grafting add an additional level of diversity and adaptive potential to explore.

At the physiological level, these mechanisms are related to processes such as root system development and functioning (water and nutrient uptake), interactions with the soil microbiome, gas exchange regulation, hydraulic properties along the soil-plant-atmosphere continuum, reserve storage, short and long distance signaling mechanisms and plasticity for some of these traits. At the molecular level, hormonal, osmotic and oxidative metabolisms are involved. Considering all together, adaptation to any constraint appears as a complex property arising from the interaction of these processes.

Based on a review of recent literature related to grapevine and other plants, and some studies performed in our own laboratory, this communication will illustrate the diversity of adaptive responses, how these responses characterize different adaptation strategies and how these strategies can be leveraged to select new genotypes for the future.

Keywords: Vitis spp, hydraulic traits, microbiome, root development, signaling.