PHYSIOLOGICAL AND PERFORMANCE RESPONSES OF GRAPEVINE ROOTSTOCKS TO WATER DEFICIT AND RECOVERY

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Abstract:

Context and purpose of the study - Rootstocks play a key role in the grapevine's adaptation to the increasing soil water scarcity related to climate change. A pot experiment carried out in 2022 aimed at assessing the physiological responses of seven ungrafted rootstocks to a progressive soil water deficit and a subsequent recovery to field capacity.

Material and methods - On six occasions over the season (one at well-watered, three at water deficit and two at recovery conditions), vine water relations and leaf gas exchange parameters, soil respiration and leaf chlorophyll content were determined and vegetative development was measured. The genotypes evaluated were four commercial rootstocks (110-Richter, 140-Ruggeri, Evex 13-5 and Fercal) and three recently bred (RG3, RG8 and RG9)

Results - Results showed that genotype significantly affect total biomass production, leading to differences of up to 33% between the vigorous 140-Ruggeri and Evex 13-5. Moreover, the ratio of carbon allocation in root and shoots was highly affected by genotype, although soil respiration only showed differences among them at specific soil water status. Rootstock genotypes had little effect on plant water status under well-watered conditions but significantly affected it under water deficit and recovery. Leaf gas exchange parameters showed significant differences among genotypes within each water status. At most stages, 110-Richter displayed higher stomatal conductance and photosynthetic rates than Fercal, despite the overall higher leaf chlorophyll rates of the latter. In fact, the lower osmotic adjustment capacity shown by 110-Richter compared to Fercal may be affecting water relations in such a way that it confers higher leaf gas exchange rates than the latter. In turn, it seems that this may be related to the lower investment of 110-Richter in root biomass compared to aerial biomass, in contrast to Fercal. These results highlight the large differences in rootstock responses to water availability and unravel their physiological basis. Further studies are needed to assess how these responses are transferred to the scion.

Keywords: Grapevine, water relations, gas exchange, respiration, biomass