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COULD FRUITS MODIFY LEAF SOLUBLE SUGARS AND DETERMINE WATER-CARBON RELATIONS IN PLANTS?

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Abstract: Water scarcity is one of the main restrictions to achieve food security for a growing population. Thus, new deficit irrigation strategies are being developed based on plant physiology but surprisingly, little is known on fruit physiology. The recent results on the importance on non-structural carbohydrates (NSC) to facilitate osmotic adjustment (Blum, 2017) and their differential transport depending on the water stress level (Gersony et al., 2020) could be useful to explain the effect of fruit loading on plant water relations but it has not been studied yet. The aim of this work is to study the effect of the fruit presence or absence on the leaves water relations mediated by their effect on leaf soluble sugar dynamics and thus, on leaf osmotic potential analyzing (i) the regulation of stomatal conductance (g_s), net photosynthesis (A_N) and leaf water potential (Ψ_{leaf}) produced by fruits and (ii) determine leaf osmotic potential (π) and NSC dynamics depending on the presence or absence of fruits and water stress. The experiment was carried out between July and November 2018 on twelve olive trees. Six of them were well-watered (WW) trees and the rest were water-stressed (WS). In each of these treatments, half had the presence of fruits (+) and the other half had absence of fruits (-) (n = 3). A_N, g_s, Ψ_{leaf}, were measured weekly and π and NSC content were measured in four specific moments in each tree. The results showed that WW+ presented higher A_N and g_s values, lower leaf NSC and π less negative than WW-, indicating that carbohydrates were being exported to the fruit. Assuming that fruits behave as a carbon sink organ, we also observe that WS+ presented more negative Ψ_{leaf} values than WS-. This response would be modulated by the hydric treatments, because the effect of A_N and g_s was not as prominent in WS nor that of the hydric potential

in WW. In conclusion, our results suggested that fruits can modulate leaf NSC and maintain the carbon and water relations under water stress.

Key words: water stress, non-structural carbohydrates (NSC), stomatal conductance, photosynthesis, fruit load.

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References:

Blum A (2017) Osmotic adjustment is a prime drought stress adaptive engine in support of plant production. Plant Cell Environ **40**: 4–10

Gersony JT, Hochberg U, Rockwell FE, Park M, Gauthier PP, Holbrook NM (2020) Leaf carbon export and non-structural carbohydrates in relation to diurnal water dynamics in mature oak trees. Plant Physiol pp.00426.2020