# Evaluating the drought tolerance of *Quercus ilex* L. through its physiological and biochemical responses to severe water stress and rewatering: is this species suitable for our future cities?

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Climate change is expected to cause more intense drought spells in the coming decades especially in the Mediterranean Basin. As for the urban environment, where live the 54% of the World population, it has been observed that increased water scarcity has resulted in high mortality rates of trees and has triggered the loss of many benefits linked to urban greening. In this context, it is uncertain how the trees will cope with the predicted increasingly extreme climate conditions in urban context. Understanding the physiological and biochemical responses to drought and recovery is a key factor for the sustainable planning of trees in cities and their future management.

The aim of this study was to estimate the drought tolerance of *Quercus ilex* L. (holm oak), one of the most common tree species in our urban environment. To this end, a pot experiment was carried out on three-years old seedlings *Q. ilex* plants subjected to progressive water stress followed by rewatering, while control plants were maintained in well-watered conditions. Ecophysiological (water relations, gas exchanges and chlorophyll fluorescence) and biochemical (flavonols' and chlorophylls' epidermal content and biogenic volatile organic compounds, BVOCs) measurements were performed.

Gas exchanges and water relations significantly differed between water stressed and control plants both under drought and after rewatering. Chlorophyll fluorescence parameters were reduced in stressed plants compared to controls and did not fully recover after rewatering, highlighting that treated plants were chronically photo-inhibited. Qualitative and quantitative changes in BVOCs emission were also detected. Water stress significantly reduced BVOCs emissions and changed their blend. As previously reported in plants facing with heat stress, the emission of high molecular weight monoterpenes was greater in water stresses plants compared to controls. In conclusion, despite holm oak is considered a species well adapted to water scarcity, raising in frequency and intensity of drought events expected in the future could compromise its survival and vitality in our cities. Moreover, considering that *Q. ilex* is a no-storing and high-monoterpenes emitter, variations the production of BVOCs due to abiotic stresses may have important implications for urban air quality.

**Keywords:** urban greening, *Quercus ilex*, drought, recovery, monoterpenes.