

Relationship between carbon and water economies and drought-vulnerability in two coexistent iso- and anisohydric species.

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Stomata control carbon and water fluxes between leaves and the atmosphere. Isohydry (i.e. strong regulation of leaf water potential, Ψ_l) is commonly linked to 'early' stomatal closure under drought, which in turn is believed to imply lower hydraulic risk at the expense of reduced carbon assimilation. Hence, the iso/anisohydric classification has been widely used to assess drought-resistance and mortality mechanisms across species, but the underlying assumptions have been rarely tested. These include a direct correspondence between iso/anisohydric Ψ_l regulation and stomatal behavior across species, and similar vulnerability to xylem embolism in iso- and anisohydric species. Our objective is to assess the physiological mechanisms underlying drought-resistance differences under controlled, experimental conditions between two coexistent Mediterranean forest species with contrasted drought-vulnerability in the field: the resistant *Phillyrea latifolia* (anisohydric) and vulnerable *Quercus ilex* (isohydric). We hypothesize that lower Ψ_l in *P. latifolia* will not necessarily be associated with narrower hydraulic safety margins or longer periods of positive gas exchange under drought. Isohydric behavior was confirmed in *Q. ilex*, but did not imply lower hydraulic impairment, due to lower resistance to xylem embolism in this species. We found similar temporal patterns of stomatal conductance and assimilation between species. If anything, the anisohydric *P. latifolia* tended to show lower assimilation rates than *Q. ilex* under extreme drought. The fact that *P. latifolia* was as carbon-constrained as *Q. ilex* was also indicated by similar growth rates and carbon reserves dynamics in both species. Despite similarities in carbon management between species, after two years with no water supply *P. latifolia* mortality was less than half of *Q. ilex* mortality by this time. Our study warns against making direct connections between Ψ_l regulation, stomatal behavior and the mechanisms of drought-induced mortality in plants and suggests that hydraulic failure remains the most likely cause of death of *Q. ilex* under extreme drought.