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Hydraulic strategies of the longest-lived Southern Hemisphere conifer to face aridification

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Fitzroya cupressoides is an endemic and endangered conifer, and the oldest tree species in the Southern Hemisphere. Despite *Fitzroya* forests growing in relatively wet environments, populations growing in the Coastal Range and Central Depression of southern Chile, frequently face very dry conditions during summer. This is a consequence of the Mediterranean climate influence at these latitudes (40˚-41˚ S). Thus, *Fitzroya* forests from the Coastal Range present a decreasing trend in tree-ring growth associated to drier and warmer summers during recent decades; and have been affected by dieback events associated to extreme drought events in the past.

This work focused on evaluating the vulnerability of *Fitzroya* adult trees and saplings, from two southern Chile populations, to climate change. Stands growing in the Coastal Range (AC) and Central Depression (FN), where *Fitzroya* forests receive the lowest precipitation amounts and/or where soils have a very poor water retention capacity, were studied. We assessed water potentials (WP) throughout the growing season 2015-2016, their relationships with environmental conditions, as well as leaf and stem hydraulic traits and strategies to understand *Fitzroya*'s susceptibility to water scarcity. WP changes throughout the season were strongly related to soil water content variations in both sites. Minimum water potentials (WP_{min}) were not that negative in *Fitzroya* (-1.3 to-1.5 MPa), even considering that the studied summer was the second driest on record. This could be probably due to a high leaf capacitance in this species.

Adult trees and saplings from both sites did not significantly differ in their water potentials at turgor loss point (WP_{TLP}) and their associated leaf safety margins. These margins were positive and relatively low in all cases, suggesting that trees from both sites could reach WP_{TLP} somewhat easily during summer. The relatively large stem safety margins (SSM) found for *Fitzroya* in this study (adults AC: 3.65, saplings AC: 1.2, adults FN: 2.23, saplings FN: 2.52 MPa); seem to be the main hydraulic safety valve in this species. Besides the large SSM found in this long-lived species, trees would probably avoid any drought damage limiting their water stress through leaf and likely stem capacitance. Therefore, it seems that within the continuum of species strategies to cope with water stress, *Fitzroya* trees have features pertaining to the two ends of the continuum: tissues with more negative P_{50} and large safety margins, and tissues that maintain milder operation pressures through reliance on capacitance.

Although *Fitzroya* appears to be relatively resistant to water scarcity, saplings growing in the Coastal Range, seem to be the most vulnerable to the current and future aridification trend in southern Chile. This places a warning about the future of *Fitzroya* forests in this area, and field monitoring is needed in order to assess their current structure and abundance. Moreover, although the WP_{min} reported here were not that negative, our results indicate that these WP will certainly be lower under the expected drier and warmer summers that would cause drier soil conditions in the future.