Xylem anatomy and function diverges between sexes in Juniperus thurifera

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S.01-9-Poster

Water Relations of Salix in Southern California and the Western Cape of South Africa

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Mediterranean climate ecosystems (MTE) are characterized by summer drought, but previous research suggests that Southern California has greater yearly and monthly variation in precipitation than other MTE. We hypothesized that increased summer water availability in the Western Cape of South Africa would increase groundwater and result in lower water stress in riparian species. To test this we compared dominant willows in riparian communities in the Angeles National Forest of Southern California (Monte Cristo Creek) and Dwarsberg Trout Haven of South Africa (Holsloot River). These two sites differ significantly in their fluvial regimes; Monte Cristo is a seasonal stream, and the Holsloot River is permanent. We would expected the Salix mucronata, along the Holsloot River, would be under lower water stress and be more vulnerable to cavitation as a result of maximizing water transport, whereas Salix laevigata of Southern California would more resistant to cavitation and be under greater water stress. However, our results reveal there is no difference in vulnerability to cavitation, with P50 values between -3.1 and -3.3 MPa and no difference in midday water potentials. However, significant differences in predawn water potentials, with S. mucronata less stressed compared to S. laevigata, suggests S. mucronata is most likely losing more water throughout the day probably due to higher carbon uptake. Phylogenetic constraints may limit the capacity of water transport in the genus Salix; however, S. mucronata is able to maintain higher stomatal conductance as a result of greater water availability.

S.01-10-Oral

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Contrasting evolutionary pressures associated to sex can result in sex-related variation in non-reproductive traits such as growth, photosynthetic rate or drought tolerance. This variability may potentially skew the ability of each sex to face climatic constraints. We explored intraspecific differences in stem anatomy and branch hydraulic functionality between Juniperus thurifera sexes in two localities with contrasted climate (drier vs. wetter). Tracheid lumen area was similar between sexes and sites, but female tracheids had lower wall thickness, meaning lower construction costs. Stem anatomical estimates of hydraulic efficiency and safety showed sex-related differences that were particularly evident in the arid site. Here, males reduced their estimated hydraulic conductivity (KS) and increased their Mork's Index, that is, produced safer wood, whereas these parameters did not differ from mesic site in females. In contrast, branch measurements of KS and P50 (xylem pressure inducing 50% loss of hydraulic conductance) showed no sex or site-related differences, albeit males showed higher slope of the vulnerability curve (S, indicating how fast cavitation progresses to P50) than females. This conveys to males potential to maintain higher KS than females in water potentials over P50. Stem anatomical traits explained a large proportion of branch functional variability. Our results provide insight of the interaction between xylem anatomical variability and hydraulic function. Building lower-cost xylem may allow females to have higher secondary growth per carbon invested. However, this strategy may reduce their drought tolerance in their dry distribution edge, what would explain their lower performance in relation to males under these conditions.