Clues to trees' salt tolerance found in native habitat, leaf traits

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Urban landscape plants are often subjected to environmental conditions well beyond those of their native habitat. Differences in precipitation, along with stress caused by increased salinity resulting from irrigation with brackish reclaimed water, can have devastating impacts on trees and plants. Use of salt-tolerant species and implementation of proper management strategies can reduce the incidence of plant stress and loss. Researchers in Utah looked to plants' native habitats for ways to identify salt tolerance among tree species used in urban landscapes in the arid to semiarid areas of the Intermountain West.

"We compared salt tolerance of two closely related maple species: canyon maple (*Acer grandidentatum*) and bigleaf maple (*Acer macrophyllum*), the western relatives of the sugar maple," explained corresponding author Nisa Leksungnoen, from the Department of Plants, Soils, and Climate at Utah State University. "Our aim was to assess the degree that salt tolerance could be inferred from native habitat and leaf traits and so suggest *de facto* salt tolerance screening of other regionally native species for low water, salt-affected landscapes," Leksungnoen said.

The scientists compared the two maples to *Eucalyptus camaldulensis* (red gum), an Australian tree native to saline bottomlands that features evergreen foliage and documented salt and drought tolerance. To assess growth and appearance performance in landscapes, the research focused on measures of leaf damage, gas exchange, and hydric behaviors that respond rapidly to salinity. The results of the study were published in

HortScience.

The two maple species and the eucalyptus were subjected to five salinity treatment levels. The scientists measured leaf damage, stomatal conductance and leaf water potential, and photosynthesis. "Eucalyptus showed a key salt-tolerance mechanism by excluding salts from uptake, whereas the two maple species did not," said Leksungnoen. Results also indicated that canyon maple was more resistant to leaf damage than bigleaf maple, but more affected at higher salt concentration than eucalyptus. Eucalyptus leaf area was unaffected by any salinity treatment with no signs of damage on any leaf at any salinity level; in comparison, both maple species exhibited leaf damage and margin burn at different levels of salinity.

Eucalyptus and bigleaf maple also edged canyon maple in terms of gas exchange and water relations. Canyon maple was intermediate between eucalyptus and bigleaf maple in terms of hydric behavior, the extent that internal water potential varies with soil and atmospheric water deficits.

The researchers inferred that canyon maple salt tolerance arose from the tree's native Intermountain West semiarid woodland habitat, which is characterized by seasonal soil drying. "Canyon maple's tolerance is in contrast to bigleaf maple's salt riparian habitat where seasonal soil drying is rare enough to not induce any level of salt tolerance," they noted. "Eucalyptus from a wet-saline habitat then frames canyon maple with a much higher level of salt tolerance in leaf appearance, gas exchange, and hydric behavior."

"Our results suggest that canyon maple can be used in Intermountain West urban landscapes that are irrigated with reclaimed water with electrical conductivities classified as moderate or less, assuming sufficient leaching fraction and minimal foliar interception of overhead irrigation water, because salt on leaves is more damaging than salt-

affected soil in hot, high evaporative demand climates such as the United States Intermountain West region," the authors said.

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site: hortsci.ashspublications.org/c … t/49/9/1194.abstract

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