A metabolomic and morphophysiological approach to understanding mangrove adaptations to saline stress as a consequence of hydrological disturbances

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October 19, 2022

Abstract

Mangrove plants are cyclically exposed to variations in salinity. However, high salinity for long periods can significantly alter their metabolism. Here, we studied the effect of contrasting interstitial salinities (45 ppt vs. 70 ppt) on leaf morpho-physiological traits in adult *Avicennia germinans* L. trees in the dry and rainy seasons in Tampamachoco lagoon, Mexico. In the dry season, there was low stomatal conductance and low water potential. Plants under 70 ppt of salinity had significantly lower leaf Ca and Mg concentrations than those at 45 ppt. The metabolomics results revealed that plants produced different organic compounds based on the salinity they were exposed to. The specific leaf area was significantly lower under 70 ppt of salinity (12.94 ± 0.87 g cm $^{-2}$) compared to 45 ppt (19.57 ± 1.52 g cm $^{-2}$) may as a result of the leaf stomatal conductance responses. Salt glands and trichome density were significantly higher in the leaves of trees found at the more saline site. Although mangroves are exposed to freshwater availability, saline, and tidal variation, prolonged exposure to high salinity results in morphophysiological and biochemical changes in leaves which facilitates their survival, even under extremely salt conditions.

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