Adaptive responses of stomatal characteristics of mangroves to diverse salinity levels

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Mangroves are well adapted to life in saline habitats, and among other responses, stomatal responses contribute to this adaptability. Stomata are sensitive to environmental changes and play a key role in photosynthesis and transpiration. There have been limited studies on how different mangrove species adapt their stomatal responses in diverse saline environments. This study investigates stomatal characteristics (stomatal conductance, length, width, density, index, and pore length & width) of three common mangrove species (*Avicennia marina, Excoecaria agallocha*, and *Lumnitzera racemosa*) from selected sites with different salinity levels along the eastern coast of Sri Lanka, during wet (WS) and dry (DS) seasons. The sites were Sathurukondan (WS: 0.6 ppm; DS: 6.1 ppm), Thampalagamam (WS: 2.9 ppm; DS: 15.2 ppm) and Panama (WS: 9.6 ppm; DS: 32.8 ppm). Leaf samples were taken from three individual plants per species per site. Field measurements of stomatal conductance were recorded with a leaf porometer (Meter Group 40419-SC-1) (air temperature 25°C to 31°C during WS and 32°C to 37°C during DS). Stomatal characteristics were measured using florescence microscopy and PROVIEW Software. Pearson correlation and one-way ANOVA were carried out using MINITAB 18. Results revealed significant interspecific and site-specific variations. Stomatal conductance negatively correlated with salinity and differed significantly ($p<0.05$) among sites, with higher values in the lower salinity site (Sathurukondan). Stomatal conductance was significantly higher ($p<0.05$) in WS, whereas other stomatal characteristics were lower in this season. In general, *E. agallocha* had a larger stomatal size (length and width), followed by *L. racemosa* and had the highest stomatal index (16.1–10.4%). *A. marina* had significantly smaller stomata. This was coupled with the highest stomatal density (131.3–102.6 stomata/mm^2). *L. racemosa* showed the lowest stomatal density (63.6–37.2 stomata/mm^2), stomatal index (8.8–6.9%) and stomatal conductance. Overall, stomatal density and index significantly decreased with increasing salinity. These stomatal responses likely facilitate water conservation in highly saline environments, contributing to the mangroves' survival in coastal environments. The study underscores the importance of stomatal characteristics when selecting species for restoration efforts, as these traits may enhance the species' ability to cope with salinity stress and ensure restoration success.

Keywords: *Mangroves, Salinity, Season, Stomata*