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Morphological and Anatomical responses of *Rhizophora mucronata* Lam. to water stress under green house condition

H.M.T. Madhurangi[1], N. P. Dissanayake[1]*, K.A.S. Kodikara[1], A. J. D. Perera[1] and L. P. Jayatissa[1]

[1]*Department of Botany, Faculty of Science, University of Ruhuna, Matara, Sri Lanka.*

Importance of mangrove restoration has been recognised all over the world due to the ecological services and products derived from them. Nevertheless, higher failure rates in restoration attempts are recorded in many parts of the world. Therefore, the objective of this research was to study the impact of two common stress factors, physical drought *i.e. water deficiency in soil* and physiological drought *i.e. difficulty in absorbing water due to high salinity*, on the growth and survival of *Rhizophora mucronata* Lam. (Rhizophoraceae) seedlings. The propagules of *R. mucronata* planted in pots (one propagule per pot), were maintained in a plant house under three physiological stress levels, i.e. high salinity (35±1psu), moderate salinity (15±1psu) and fresh water (0psu) and under three levels of physical water stress, i.e. ~25%, ~50% and ~100% of Water Holding Capacity (WHC). There were three replicates per treatment. The growth performances of seedlings were measured considering the morphological responses and anatomical features once a two week and once a month respectively for six months of period.

Leaf curling, wilting and necrosis and a significant reduction in leaf area and cumulative shoot height were observed in seedlings under high saline condition and, at 50%WHC treatments. None of the seedlings survived at 25%WHC level. Stomatal density, vessel density and vessel grouping index were significantly higher while width of stomata and vessel diameter were significantly lower in high and 50%WHC treatments compared to the other treatments. Variations in anatomical features revealed that the secured and safety adaptations in mangrove seedlings to avoid the formation of air bubbles inside vessel elements have been increased under high stress levels. The best performances were observed in seedlings under moderate salinity, and under 100% WHC with fresh water, respectively. The results imply that the physiological and physical drought could be major reasons for higher failure rates in mangrove restoration attempts. However, a field study must be conducted to confirm the effect of physical and physiological drought on mangrove seedlings in order to formulate recommendations for mangrove restoration.

Keywords: Anatomy, Mangroves, Restoration, Water stress

*nandapd@bot.ruh.ac.lk