Assessment of protective and desalination function of coastal plants for development of strategies to use them for coastal protection and desalination of tsunami affected areas along the western and southern coasts of Sri Lanka

By

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Abstract

The Indian Ocean tsunami in 2004 revealed the inferiority of hard engineering solutions in coastal protection and provided sound evidence over the potential of coastal vegetation, particularly mangroves and seashore plants in protecting the coast against erosion and occasional natural calamities like tsunamis.

Present study was initiated therefore to determine the extent to which plants could be used not only to protect the coast against erosion and damage by tsunamis, but also to desalinate coastal areas affected by tsunami.

Structure of mangrove vegetation at Kirinda, Kalametiya and Rekawa along with coastal vegetation at Seenigama and Induruwa that resisted tsunami waves for varying extents in 2004 was studied in detail to discern the structural parameters that contribute most to the wave attenuation function of these vegetations. It was revealed that relative capacity of wave attenuation by coastal vegetation depends on its' structure, particularly the basal area, tree volume and porosity Depth of tsunami sediment within these mangrove areas was used as an surrogate variable for its wave attenuation capacity.

In order to determine the structure of green belts required for coastal defense, south western and southern coasts of Sri Lanka were characterized according to erosion rates, using aerial photographs and GIS. Structure of the green belts appropriate for various coastal segments were then determined.

Relative capacity of mature mangrove plants in removing NaCl salt from sediment was determined by titrating plant and sediment samples with 0.01 N $AgNO_3$ in the presence of potassium thiocynate as an indicator. It was revealed that *Avicennia marina* and *Ceriops tagal* are more capable in performing this function. This was further confirmed by measuring salt uptake rates of hydroponically grown seedlings of these species and it supported the hypothesis that mangrove seedlings can be used to remove salt from sediment (seedlings have to be removed after a period to remove the salt absorbed along with it).

Vegetative propagation is more appropriate to mass produce of seed material for mangrove green belts. *Rhizophora apiculata* was found feasible to propagate through propagule cuttings and was able to produce three saplings from one propagule. IBA (1000 ppm) was the best hormone concentration for inducing roots in them and IBA (1500 ppm) for best shoot production from propagule cuttings of *Rhizophora apiculata* Moreover, the study found that potting media consisted of Mangrove soils alone as well as mangrove soils (1): sand (1), terrestrial soil alone and mangrove soil (1): terrestrial soil (1) can be used as nursery growth media for *Rhizophora apiculata* and *Ceriops tagal.*

Present study therefore reveals that a great potential exists to adopt economical plant-based soft engineering solutions for coastal protection and desalination of costal saline soils using mangroves and species such as *Pandanus odorotissimus*.

Key words: tsunami, mangroves, propagules, plant models, hormones, NaCl salt