

A Novel Floatable Planting Material for Inner Mangrove Forest Inspired by *Barringtonia asiatica*

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Older mangroves in the inner mangroves areas have been perishing at an increased rate and cannot be accessed for restore due to the dense roots of plants, resulting in a decrease in the inner area. In this work, we therefore present an innovation to restore the inner mangrove forest by utilizing floatable planting material. Firstly, we used natural rubber as the main material and mixed it with bagasse (B) and soybean meal (S) to provide food for the saplings after its decomposition. Our prototype configuration was inspired by the structure of *Barringtonia asiatica*. For optimization, different ratios of the mixture were investigated. The results showed that the B1S1 formula gave the best performance in the moulding with a porosity of approximately 40% by volume. Ninety days after planting *Avicennia alba*, it was 41.7 ± 0.5 cm tall with 18 ± 2 leaves. The planting material degraded gradually by $27 \pm 0.4\%$ and $18.0 \pm 0.3\%$ (by weight) in soil and seawater, respectively. Additionally, the organic matter of the soil, and the conductivity and BOD level of the seawater before/after the degradation were compared. They were 2.5%, 5.1 mS/cm and 1.45 mg/l before and more than 3.5%, 7.6 mS/cm and 2.11 mg/l after, respectively. This indicated that our material does not significantly affect the environment. A Computational Fluid Dynamics simulation, showed that the planting material can efficiently restore the inner mangroves, with good distribution in all planting areas, and takes around one hour to float the 100-metre distance from the outer to the inner forest, with 100% success.

Awards Won:

Sigma Xi, The Scientific Research Honor Society: First Life Science Award of \$1,500

Second Award of \$2,000