Characterization of Biosurfactant-Producing Bacteria Associated with Brown Macroalgae from the Southern Coast of Sri Lanka

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Biosurfactants are amphiphilic substances which are produced by microorganisms. Marine bacteria associated with seaweeds have gained significant attention due to their ability to produce biosurfactants with diverse industrial and environmental applications. This study aimed to isolate and characterize biosurfactant-producing marine bacteria associated with brown seaweeds, and assess the biosurfactant activity of these bacterial isolates. Five brown seaweed species (*Sargassum illicifolium, Sargassum crassifolium, Sargassum longifolium, Sargassum wightii* and *Padina antillarum*) were sampled from Thalpe and Hikkaduwa, along the southern coast of Sri Lanka in January 2026. Bacterial isolates from the holobionts were characterized by standard biochemical assays, including enzyme assays for lipase and protease activity, and were tentatively identified based on Bergey's Manual of Systematic Bacteriology. Selected isolates were screened for biosurfactant production using multiple assays, including the drop collapse assay, oil spreading assay, microplate assay, emulsification index assay (E24) and bacterial adhesion to hydrocarbons (BATH) using diesel, olive oil and soybean oil as hydrocarbon sources. The study revealed the dominance of the genera *Vibrio* among the other isolates. The isolate S6, demonstrated the highest overall emulsification index (E24% = 83.3%) but the lowest hydrophobicity (BATH = 22.7%) by suggesting that S6 is a specialist in producing extracellular biosurfactants which is good for making stable emulsions. In contrast, S8 is the "Star" of the study, because it maintains a balanced profile by achieving a high surface activity (Oil spreading = 2.2 cm) with significant cell-surface hydrophobicity (BATH = 73.0%) which make it a better robust candidate for biodegradation. Significantly, both these isolates were *V. alginolyticus*. Therefore, this study highlights the potential of brown seaweed-associated bacteria, particularly *Vibrio alginolyticus*, as sources of efficient and eco-friendly biosurfactants. These biosurfactants have promising applications in industries such as cosmetics and detergents, as well as in environmental bioremediation.

Keywords: *Marine bacteria, Biosurfactants, Brown seaweeds, Bioremediation*