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Review

Nutritional and bioactive potential of seagrasses: A review

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ABSTRACT

Seagrasses, one of the most threatened yet overlooked ecosystems on Earth, are the only flowering plants to recolonising the seabed. Apart from their critical ecological prominence on the life of many marine organisms, seagrasses are also used as an alternative or complementary medicine to manage an array of pathological disorders such as muscle aches, wounds, abdominal pain, indigestion, hangover, and mental disorders. However, a compilation of existing work on their ethnopharmacological uses, nutritional values, pharmacological propensities and bioactive compounds is lacking. Thus, this review aims at elaborating on the biochemical composition, phytochemical analysis, and biological properties including antioxidant, antimicrobial activities of various species of seagrasses. Seagrasses harbour several metabolites with multiple bioactivities. The phytochemical compounds isolated from *Zostera marina* L., *Thalassia testudinum* K. D. Koenig, and *Thalassodendron ciliatum* (Forssk.) exhibit a plethora of biological activities, including cytotoxicity against cancer cell lines, anti-human immunodeficiency virus (HIV), antimicrobial, and skin regenerating properties. This review also identifies vital lacuna in seagrass research. For instance, the mechanism and site of action of compounds displaying potent biological activities has not been adequately addressed together with optimisation of extraction methods to isolate minor metabolites and applying technological advancements in biological assays. In conclusion, this review provides a synthesis of current knowledge and highlights future work that needs to be undertaken for the biomedical application of such natural resources.

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1. Introduction

Since ancient times, traditional practitioners for treatment of various diseases have utilized medicinal and herbal plants in primary health care systems (Saleem et al., 2019a; Saleem et al., 2019b). Currently, scientists are focused on exploring phytochemicals present in these medicinal plants as 80% of world's population rely on these conventional treatments for management of different diseases (Aziz et al., 2014). The quest for bioactive compounds from plants has led to the discovery of new pharmacophores and medicinal drugs which offer efficient protection and treatment regimens against a plethora of chronic pathologies, namely cancer (Kumar et al., 2004; Sheeja and

Kuttan, 2007) and neurodegenerative diseases such as Alzheimer's (Mukherjee et al., 2007). To date, the health benefits of many phytochemicals have been substantiated in the current pharmacological record (Rouhi, 2003). For instance, pilocarpine derived from *Pilocarpus jaborandi* Holmes has been used as a clinical drug to treat glaucoma for over 100 years (Dias et al., 2012), vancomycin isolated from *Amycolatopsis orientalis* cultures is an approved Food and Drug Administration (FDA) drug to treat severe infection (Jeong et al., 2013).

Despite terrestrial plants proving their worth as a potential source of bioactive compounds, the quest for novel prophylactic metabolites should be an ongoing and continuous task, since new diseases keep emerging and existing diseases keep changing their mechanisms of action (Malve, 2016). Alternative sources of plants with different

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