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Research Article

PHYTOCHEMICAL AND BIOCHEMICAL ANALYSES OF *SYRINGODIUM ISOETIFOLIUM* (ASCH.) DANDY

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ABSTRACT

Seagrasses are the flowering plant found in marine ecosystem. It has many bioactive compounds with various applications including pharmaceutical and nutraceutical. The present study has been aimed to evaluate the nutritional composition and antioxidant potentials of the Seagrass *Syringodium isoetifolium*. The Seagrass exhibits significant amounts of biochemical and phytochemical compositions. In *in-vitro* antioxidant, DPPH, ABTS and Hydroxyl radical scavenging assay showed that *S. isoetifolium* was an excellent scavenger for free radicals. The results suggest that the Seagrass *S. isoetifolium* may be used as a very good renewable marine resource for potential biomedical applications in future.

Keywords: Seagrasses, Phytochemical, Antioxidant, Nutrition and Minerals.

INTRODUCTION

Diverse marine species have produced a number of chemically distinct chemicals, some of which are being studied for their potential use in the creation of novel medications (Ghareeb *et al.,* 2020). Seagrasses, a convention of marine blossoming plants, possess the flowing and sub-flowing regions of shallow and protected areas of oceans, inlets, bayous, backwaters, tidal ponds, and estuaries around on mild and tropical shorelines of the world (Meena *et al.,* 2022). Globally, 72 species under 4 families (Zosteraceae, Hydrocharitaceae, Posidoniaceae and Cymodoceae) of Seagrasses has been found of which the seagrasses is one of its true marine flowering plants (Short *et al.,* 2016 and Jeyapragash *et al.,* 2021). Seagrasses are eukaryotic organisms that can be found, with the exception of the Polar Regions, in shallow water sections of moderate, subtropical, and tropical oceans (Mehari Ghebretinsae *et al.,* 2019). The most species are found in the Gulf of Mannar and Palk Bay, followed by the Andaman & Nicobar and Lakshadweep islands. Seagrasses offer a variety of ecosystem services to meet human requirements, either directly or indirectly (Jaya Durga Jaisankar and Arumugam Ramasubramanian, 2022). The marine environment is an extraordinary source of novel bioactive chemicals, which frequently have different structural and chemical properties from naturally occurring substances on land (Sawssen BelMabrouk *et al.,* 2020). Seagrasses are the only group of flowering plants that successfully recolonize the sea by evolving specialized above and below-water organs. They are unique submerged marine angiosperms (Puntip Wisespongp *et al.,* 2022). Recently, it was discovered that *P. oceanica* secondary metabolites increased in response to seagrass stress brought on by human activity and climate change (particularly phenolic compounds) (Mannino and Micheli, 2020).

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The sea environment has extraordinary biological characteristics that have been important in the identification of numerous therapeutic leads (Selvam *et al.,* 2022). While phytochemical screening presents a foundational understanding of the therapeutic value of plant extracts and serves as a starting point for drug discovery (Efren Tangon *et al.,* 2019). For determining the nutritional value of marine predators determining prospective sources of protein and lipids for industrial usage or potential human intake, it is essential to understand the chemical composition of seagrass. Phytochemical analysis, which gives essential knowledge regarding the use of plant extracts as pharmaceuticals, aids in the discovery of new treatments (EfrenTangon *et al.,* 2021).

Benefits for Seagrasses in medicine

Seagrasses are having therapeutic effects against fevers, mental illnesses, wounds, skin conditions, muscle soreness, and stomach observers (Gono *et al.,* 2022). Seagrasses have been used as fertilizer, food for cattle and humans, and ethnomedicine (Kavitha *et al.,* 2020). Further the Seagrasses have large range of secondary metabolites with distinctive characteristics that could be used to make powerful and efficient medications for a number of ailments (Gono *et al.*, 2022). The bioactive substances from *S. isoetifolium* were also found to have antioxidant, neuroprotective, antibacterial, anticancer, anti-inflammatory and antidiuretic properties (Kumar and Pandey, 2013). According to Hutomo *et al.*, (2014), seagrasses are blooming plants (Angiospermae) that are submerged in shallow sea water and have been used to cure wounds, muscle pain, skin conditions and indigestion. By indigenous societies living along the coastal area, consume seagrass biomass has frequently been used as food and medicine (Vieira *et al.*, 2018). Based on the literature, seagrass are the marine biomass have numerous biomedical applications. Therefore, the present study has been selected the seagrass *S. isoetifolium* for analysis of biomedical phytochemical and antioxidant activity.

MATERIALS AND METHODS

Collection and identification of plant material

The *Syringodium isoetifolium* seagrass were collected from Kilakarai (9.2343° N, 78.7836° E), Tamil Nadu, India (Plate.1). The plants were identified at Botany Department, Periyar University, Salem, Tamil Nadu, India. The preserved Seagrass voucher specimen and Ref. no (PU/BOT/HVO.086) was submitted to the herbarium. The collected seaweed material was thoroughly washed with seawater to remove epiphytes, calcareous particles and kept in the laboratory and washed with tap water. A portion of the seagrass was taken for the preparing herbarium as well as preserved in 6% seawater formalin for identification. The remaining sample used for extraction.

***Syringodium isoetifolium* (Asch.) Dandy**

Plate 1. Collected seagrass.

Phytochemical analysis

The following procedures of Harborne (1994), phytochemical analysis were performed to determine the presence of active phytochemical elements in the extracts.

Proximate analysis

The proximate composition of *S. isoetifolium* was determined by (AOAC, 2000, Matanjun *et al.*, 2009). The moisture and ash content was followed by using gravimetric methods (World Health Organization, 1998). Carbohydrates, lipids, and dietary fibre (AOAC, 1995, James, 1995; Siddique and Aktar, 2011). The nitrogen of protein was followed by Kjeldahl method, (AOAC, 2000).

Determination of Minerals

The mineral composition of *S. isoetifolium* was examined by using ICAP200. In terms of the sample dry weight, the mineral value was reported as mg/100g.

Antioxidant activity: DPPH assay

The DPPH (2-2 diphenyl-1-picryl hydrazyl) radical scavenging activity of the *S. isoetifolium* ethanol extract was investigated. 20 to 100 mg/mL was the range of concentrations. Ascorbic acid was also added. The mixture of *S. isoetifolium* ethanol extract and 0.1 mM DPPH solution in ethanol was allowed to react for 30 minutes at room temperature and in the dark. A spectrophotometer set at 517 nm was used to measure the absorbance of the reaction mixtures (Vino *et al.*, 2020).

ABTS assay

The ethanol extract of *S. isoetifolium* was examined for its capacity to scavenge ABTS radicals. Then, 7 mM ABTS and 2.45 mM potassium persulfate were combined to create the ABTS stock solution, which was then incubated for 16 hours in the dark. After incubation, the stock solution was diluted with ethanol to create the working solution at various concentrations. The absorbance was measured at 734 nm after 30 minutes of incubation at room temperature. Ascorbic acid was employed as a baseline (Hemlata *et al.*, 2020).

H_2O_2 Radical Scavenging Assay

The method of, *S. isoetifolium* ethanol extract capacity to re move H_2O_2 was assessed (Ruch Cheng and Klanuing, 1989). The absorbance of hydrogen peroxide at 230 nm was mea sured after 10 min. Against a blank solution made up of ph osphate buffer without hydrogen peroxide. The extracts (1.0 ml) were added to a hydrogen peroxide solution made in 0.1 M phosphate buffer saline (pH 7.4 40 mM and 0.6 ml).

The percentage of scavenging was calculated by using following formula;

$$\text{Percentage scavenged } (H_20)=(A-A_1)/AX100$$

RESULT AND DISCUSSION

The qualitative phytochemical analysis of ethanol extracts of *S. isoetifolium* were recorded in Table-1. The results showed alkaloids, phenols, sterols, cardiac glucosides, tripenoids, protein and amnio acid in the ethanol extract of *S. isoetifolium*. The similarly were observed Selvam *et al.,* 2022. Alkaloids and secondary metabolites, including phenol, fatty acids, and sterols, are abundant in seagrass (Tangon *et al.,* 2021). Research on secondary metabolites is frequently moving in the direction of bioactivity-focused medication discovery. Numerous intricate and unique chemical entities are produced as a result of research into the marine ecology (Kim *et al.,* 2021). Considering that seagrass has a high concentration of antioxidants such polyphenols, terpenoids, flavonoids, tannins and saponins. Recent study has increased the hunt for new compounds derived from seagrass (Ansari and Ghanem, 2019). Triterpenoids glycosides known as saponins are present in many different types of plants. Numerous studies have been done on saponins immunostimulant, permeability, hypocholesterolemic, and anticancerogenic characteristics (Selvam *et al.,* 2022). There have been reports of some seagrass groups of phenolic compounds found in both marine and terrestrial species, while others, such bromophenols and phlorotannins, are solely found in marine sources (Raquel Mateos *et al.*, 2020).

Table 1. Preliminary Phytochemical screening of *S. isoetifolium.*

Phytochemicals	*S. isoetifolium*
Alkaloids	+
Carbohydrates	-
Flavonoids	-
Phenols	+
Saponins	-
Tannins	-
Glucosides	-
Sterols	+
Cardiac glycosides	+
Resins	-
Terpenoids	+
Protein and amino acids	+
Triterpenoids	-
Reducing Suger	-

Present (+); Absent (-)

Table 2. Nutrition factors of *S. isoetifolium.*

Biochemicals	*S. isoetifolium* (% of DW)
Carbohydrate	08.52±0.097
Protein	06.23±0.072
Lipid	01.59±0.063
Ash	18.30±0.065
Crude fiber	17.07±0.085

The results represented Mean ± SD from triplicates experiments

The results of protein, carbohydrate, lipid, ash, and fibre compositions of Seagrasses *S. isoetifolium* is presented in Table 2. The *S. isoetifolium* nutrient factors for highly present for ash, crude fiber and carbohydrate. Since 80% of the world population focuses on these conventional medicines to manage various diseases, scientists are concentrating on understanding the phytochemicals included in these medicinal plants (Kim *et al.*, 2021). The reported that macro and micro elements, protein, carbohydrate, lipids, ash and fiber from seagrass for better nutritional values analysis (Jeyasanta *et al.*, 2018).

Determination of Minerals

The determination of minerals was analysied *S. isoetifolium* from dry materials. The results were presented in Table- 3 *S. isoetifolium* have been good macro and micro elements such as Ca, Mg, K and N compared to other macro and micro elements. Marine organisms have been considered as good resource for nutrients and bioactive compounds (Zhong *et al.*, 2019). The macronutrients-phosphorus, potassium, calcium, magnesium, sodium and micronutrients-nickel, zinc, iron, chromium, copper, cadmium, while *S. isoetifolium* had a lower composition level, higher lipid and ash concentrations

Table 3. Mineral composition of *S. isoetifolium.*

Elements	*S. isoetifolium* (mg /kg^{-1} DW)
Ca	18.30±0.368
Mg	24.50±0.400
N	17.26±0.041
P	17.46±0.066
K	26.30±0.378
Cu	0.120±0.075
Fe	0.526±9.636
Mn	0.143±0.032
Zn	0.142±0.070

The results represented Mean ± SD from triplicates experiments

Ca-Calcium, Mg-Magnesium, N-Nitrogen, P-Phosphorus, K-Potassium, Cu-Copper, Fe-Iron, Mn-Maganese, Zn-Zinc

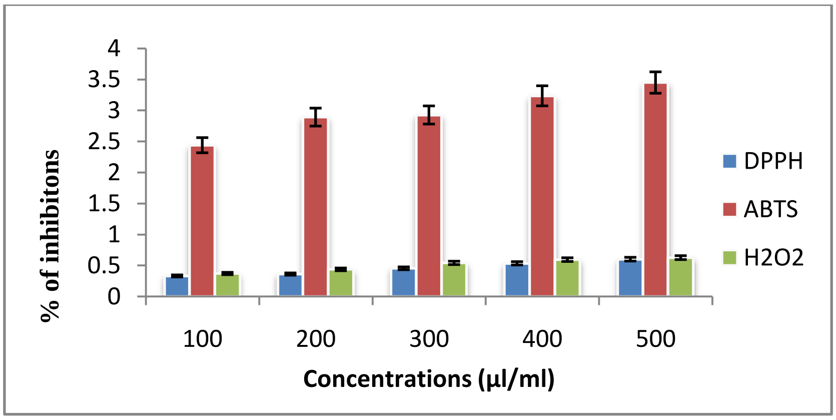

Figure 1. Antioxidant activity of *S .isoetifolim.*

Antioxidant Activity

The ethanol extract of *S. isoetifolium* tested in the different concentrations at 100, 200, 300, 400 and 500 µg/ml. All the three antioxidant activity in DPPH, ABTS and H_2O_2 assays. The highest inhibition was showed in 500 µg/ml in all the three assays (DPPH (0.603), ABTS(3.45), H_2O_2 (0.628) of ethanol extractly of *S. isoetifolium* (Figure1). The similar studies was reported that *Halophila ovalis* seagrass (Athiperumalsami *et al.*, 2010). Reducing power activity was indicated that antioxidant compounds as electron donors and reduce oxidative process (Yen and Chen, 1995).

Recent studies were analysis the antioxidant properties of seagrasses (Ansari and Ghanem, 2019). The flavonoids have knowingly natural antioxidant properties so reduces oxidative damages and protecting cells and cell organs (Selvam *et al.*, 2022).

Some phenolic chemicals found in seagrasses may function as a chemical defence mechanism and contribute to seagrass adaptability (Puntip Wisespongpand *et al.*, 2022). Their capacity to scavenge free radicals aided in the prevention of oxidative stress-related chronic illnesses like cancer, heart disease, and neurological disorders Bhuyan *et* *al.*, 2017). The harmful consequences of oxidative stress may be mitigated by endogenous and exogenous antioxidants. Exogenous antioxidant supplementation is the most popular and successful method of reducing oxidative stress (Pisoschi *et al.,* 2021). The maximal antioxidant activity for *S. isoetifolium* was 86.4 percent, while the IC50 value was 122.2 g/ml. *S. isoetifolium* exhibits a broad spectrum of pharmacological actions, including antibiotic, antihemolytic, cytotoxic, antibacterial and antifungal activity according to Arora *et al.,* (2016).

CONCLUSION

According to the current research, the seagrass *S. isoetifolium* contains a large number of phytocompounds. The total amounts of alkaloids, phenol, sterols, cardiac glycosides, terpenoids, protein and amino acids were also measured. The high total phenolic content value gives it very strong antioxidant effects. According to numerous researches, phenols are the main reason why seagrass has such high antioxidant capabilities. The analysis of the antioxidant activity reveals that *S. isoetifolium* ABTS radical movement was a great strategy to decide the antioxidant capacity. Further studies are required to investigate the compounds present in this ethanol extract of *S. isoetifolium* the biological effects of these seagrasses because they have a variety of pharmacological activities.

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