Phytochemical Screening, Biochemical And Mineral Analysis Of Marine Green Algae, Boergesenia Forbesii (Harvey) Feldmann

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Abstract- *As malnutrition is emerging as a global threat, it is important to find an alternative source of nutrient rich dietary intakes that can ensure the public health. Algae as a possible source of food has already been proved. Boergesenia, a marine green algae shows potential micronutrient richness and phytochemical composition suggesting the use of this algae as a perfect micronutrient rich diet and in the drug development.*

Keywords- algae, micronutrient

I. INTRODUCTION

On an account of overwhelming increase in human population and war against the hunger in the underdeveloped and the developing countries, food has become the main problem for mankind and directed the attention towards many alternative and unconventional food groups. To overcome the lack of nutrition and to retain the population health it is important to find new and alternative sources of food. Plant life in aquatic environment is very rich and can play an important role. Therefore, utilization of these resources have taken place over hundreds of years.

Algae as a possible source of food for animal and human consumption have received increasing attention during the last three decades. Scientific researches has proven that algal resources can be better adopted as food sources in various ways and only a particular strains of algae are appropriate for this purpose (Gary and Masao, 2001). Algae have attracted the attention of scientists because of their vegetable nature and due to their carbohydrate, protein, fat and mineral contents. Algae offer an appealing solution to the world's food shortage, because of their growing time with which they can grow at the faster rate or the ability to grow at the higher temperature. Unlike conventional crops, the artificial production of the microalgae could be earned out in continuous culture vessels (Borowitzka and Borowitzka, 1988).

Algae are important sources of bioactive natural substances as they accumulate specific secondary metabolites which are high value products that have applications in the cosmetic, food and pharmaceutical industries. Algae are important for the nature ecosystem as well as in human society as they have critical functions of energy cycle, and their biomass has wide applications in the production of pharmaceutics, bioactive compounds, food and bioenergy application (Ramaraj *et al.,* 2010). The current study aims to analyze and to estimate the nutritional component of the selected species, *Boergesenia forbesii* (harvey) feldmann (Plate 1) to suggest this species as a better and alternative source of healthy diet.

***Boergesenia forbesii* (harvey) feldmann (Plate 1)**

Phylum	:	Chlorophyta
Subphylum	:	Chlorophytina
Class	:	Ulvophyceae
Order	:	Cladophorales
Family	:	Siphonocladaceae
Genus	:	Boergesenia
Species	:	***Boergesenia forbesii* (harvey) feldmann**

Boergesenia forbesii (harvey) feldmann is a marine green algae. This alga is made up of fluid-filled vesicles that are pear- or club-shaped. The vesicles are bright green and have a smooth and shiny surface. They grow up to about 3 cm tall and can be solitary or grow in colonies. Thalli composed of one to many unbranched, elongate, pyriform vesicles forming incurved rosette-like clusters. Siphonous cells 2-8 mm diameter at distal ends, 1-5 cm tall. Annular constriction prominent on tapered basal ends of vesicles. Apical orientation maintained throughout development. Rhizoid well developed from which new uprights can arise. Adventitious rhizoids, tenacular cells and lenticular cells are not present.

Distribution

Boergesenia occurs only in the tropical Indo-West Pacific where it is found in very sandy, coral rubble habitats. The distribution of *Boergesenia* in a wide range of marine habitats is reported by many algologists. A worldwide distribution of this species is found along Caribbean islands, Western Atlantic, Africa, Indian ocean islands, South west Asia. In India, this algae is found in Tamil Nadu (Tuticorin, Pamban, and Krusadai Island), Gujrat (Jalleshwar, Veraval), Lakshadweep Island (Minicoy) and Andaman and Nicobar Islands.

II. MATERIALS AND METHODS

Study area

The study area, Payyambalam Beach **(Plate 2)**, a part of Arabian Sea is located in Kannur district which is located in the Northern part of Kerala and is about mere two kilometers away from Kannur town. This area lies between 11.987' N latitude and 75.349'E longitude. Here, the climate is very hot and humid with maximum and minimum temperature ranging from 27ºC to 31^0C. The average annual rainfall is 3614 mm. The beach is associated with a children's park. Due to which the human intervention is more in this area compared to other coastal areas in Kannur.

Collection and preparation of algae

Collection of the algae was done during the month of September, 2017.
The fresh alga were collected from the seashore. The wet algae was collected along with the dirt and sand particle in a polythene bag and washed in running tap water and then in distilled water. The rinsed materials were then drained with a mesh, placed separately in shade to get completely drained. The shade dried alga were powdered using a blender and stored in sealed container for further analysis.

Crude algal extract was prepared by Soxhlet extraction method. About 25 grams of powdered algal material was uniformly packed into a thimble and extracted using 150 ml of different solvents like Water, Ethanol and Petroleum ether. For further phytochemical analysis the dried extract was kept in refrigerator.

Phytochemical and mineral analysis

The algal extracts were tested for their functional bioactive compounds by using following standard methods (Sofowra, 1993) (Harborne, 1973). Following standard methods, presence of carbohydrate, protein, phenols and tannins, flavonoids, saponins, glycosides, steroids, terpenoids and alkaloids were carried out. The quantitative estimation of macronutrients were also undertaken to predict the use of the selected algae as a perfect source of alternative food. The minerals like phosphorus, calcium, magnesium, nitrogen, sodium, potassium and iron were estimated by following standard methods.

III. RESULTS

Phytochemical and mineral analysis

The qualitative phytochemical analysis of first sample, ***Boergesenia forbesii* (harvey) feldmann (Table 1)** indicated the presence of carbohydrate, protein, alkaloid and anthraquinone. All these low polar phytochemicals were successfully extracted with ethanol. Water extract of the sample shows the presence of carbohydrate, protein and alkaloids, while, carbohydrate, protein and saponins could be extracted with petroleum ether. The selected sample shows better extraction with ethanol than with water. Whereas, petroleum ether shows very poor indication of compounds.

Using standard procedures the concentration of carbohydrate and protein from *Boergesenia forbesii* (harvey) feldmann was estimated **(Table 2).** The total carbohydrate content was 18 mg/100 grams of the sample. Whereas, the protein content estimated was 67 mg/100 grams of the sample. Mineral profiling of *Boergesenia forbesii* (harvey) feldmann **(Table 3)** shows the presence of several vital micronutrients in its phytochemical composition. It indicated the presence of 10mg/100g potassium, 10mg/100g phosphorus, 48 mg/100g calcium, 11mg/100g magnesium, 7mg/100g iron, 48mg/100g sodium and 920mg/100g nitrogen. The presence of nitrogen along with phosphorus and potassium indicate the use of this alga as a fertilizer.

IV. CONCLUSION

Qualitative phytochemical analysis of *Boergesenia forbesii* (harvey) feldmann indicated the presence of carbohydrate, protein, alkaloid and anthraquinone. Mineral profiling shows the presence of vital micronutrients in its phytochemical composition. The presence of considerable amount of the trace elements along with the indication of miscellaneous secondary metabolites shows the potentiality of the selected marine green algae to be used as a supplement to the conventional food and nutritional drinks.

As malnutrition and scarcity of food is becoming a global threat, finding natural sources of nutrition plays a vital role. In such an aspect the selected alga cane be the better suggested alternative to conventional food. Although the

macronutrient concentration seemed to be comparatively low, the selected marine algae indicated very appreciable quantity of micronutrient suggesting the utilization of this marine species in medicine.

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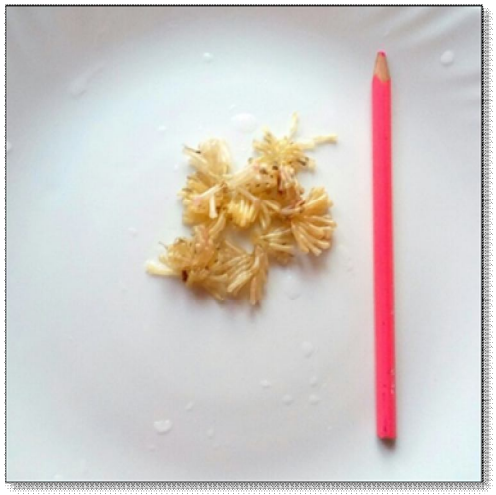
PLATE 1: *BOERGESENIA FORBESII (HARVEY) FELDMANN*



Macroscopic veiw

PLATE 2: STUDY AREA; PAYYAMBALAM BEACH, KANNUR

TABLE 1: QUALITATIVE PHYTOCHEMICAL ANALYSIS OF *BOERGESENIA FORBESII* (HARVEY) FELDMANN

Sl. No.	Phytochemicals	Solvents		
		Water	Ethanol	Petroleum ether
1	Carbohydrate	+	+	+
2	Protein	+	+	+
3	Alkaloids	+	+	-
4	Anthraquinone	-	+	-
5	Catechin	-	-	-
6	Flavonoids	-	-	-
7	Glycosides	-	-	-
8	Phenolic groups	-	-	-
9	Saponins	-	-	+
10	Steroids	-	-	-
11	Tannins	-	-	-
12	Terpenoids	-	-	-

TABLE 2: QUANTITATIVE PHYTOCHEMICAL ANALYSIS OF *BOERGESENIA FORBESII* (HARVEY) FELDMANN

Sl. No.	Macronutrients	Concentrations (mg/100g)
1	Carbohydrate	18
2	Protein	67

TABLE 3: MINERAL PROFILE OF *BOERGESENIA FORBESII* (HARVEY) FELDMANN

Sl. No.	Micronutrients	Concentrations (mg/100g)
1	Potassium	10
2	Phosphorus	10
3	Calcium	48
4	Magnesium	11
5	Iron	7
6	Sodium	48
7	Nitrogen	920