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Studies Of Physicochemical And Biochemical Composition Of Marine Red Algae G*racilaria Fergusonii* J. Ag

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Abstract

The present study deals with physicochemical and biochemical analysis of Rhodophycean algae *Gracilaria fergusonii* J. Ag was collected from Manapad coast, Tamil Nadu, India. Collected algal specimen was investigated proximate and chemical composition were using standard procedure. The moisture content, total ash value, acid insoluble and water soluble ash value was 24.6±0.324%, 36.61±0.69%, 24.24±0.19%, and 26.69±0.02% were respectively. The solvent extractive value and other biochemical composition were also recorded.

Keywords: *Gracilaria fergusonii*, physicochemical, biochemical, vitamins, pigments

Introduction

Seaweeds are reported to be rich in soluble dietary fibres, proteins, minerals, vitamins, antioxidants, phytochemicals and polyunsaturated fatty acids, with a low caloric value (Mohamed *et al.,* 2012). Commercially available varieties of marine macroalgae are commonly referred to as 'seaweeds'. Macroalgae are classified as red algae (Rhodophyta), brown algae (Phaeophyta) or green algae (Chlorophyta), depending on pigmentation, morphological and anatomical characters (Manivannan *et al.,* 2009). Red and brown algae are mainly used as human food sources (Dawczynski *et al.,* 2007). In marine algae polysaccharide may constitute up to 70% of dry matter of some red algae. Seaweeds are known as valuable sources of protein, elements, dietary fibers, vitamins, essential amino acids and essential fatty acids. Moreover, seaweeds also contain potential bio-active compounds which exhibit antibacterial, antiviral and antifungal properties (Marinho-Soriano *et al.,* 2006). Agarophytic Rhodophyceae member of *Gracilaria* species are commonly available in the shallow coastal region of study area of Manapad, Tamil Nadu, India. The present study was deals with the physicochemical and biochemical composition of red algae *G. fergusonii*.

Methodology

Collection and preparation of seaweeds

Seaweed *G. fergusonii* J. Agardh was collected from the intertidal rocks of Manapad coast of Tamil Nadu, India (8.3775°N; 78.0522°E) at low tide. Specimen was washed thoroughly in seawater to remove extraneous matter such as epiphytes and sand. After collection, fresh samples were taken into plastic jar and brought back to the laboratory immediately. Samples were washed by tape water for several times, then gently brushed and rinsed with distilled water and then dried at room temperature. The dried seaweed powder was stored in refrigerator for further uses.

Physicochemical analysis

The dried powdered sample was used to physicochemical analysis. Physicochemical parameters such as total ash value, acid insoluble ash value, water soluble ash value, different solvent (petroleum ether, benzene, chloroform, acetone and methanol) extractive values, and moisture content were determined as per method described Anonymous (1996) and crude fibre were determined (Sadasivam and Manickam, 1992).

Quantitative estimation

The dried powder sample of *G. fergusonii* was used to biochemical analysis such as estimation of carbohydrate, protein, amino acid, lipids, total free phenols, tannins, organic carbon, vitamin A, B_3, C, and pigment analysis such as estimation of anthocyanin, ß carotene, chlorophyll *a, b*, total chlorophyll and carotenoids were carried out using standard methods. The total carbohydrate was estimated by anthrone method (Sheifter *et al.,* 1950). Protein was estimated by Lowry's method (Lowry *et al.,* 1951). Amino acid was estimated by ninhydrin method as suggested by Rosen (1957). Lipids were estimated by Bligh and Dyer (1959). Other biochemical's like estimations of total free phenols by Folin-

Ciocalteu's method (Sadasivam and Manickam, 1992), tannin was vanillin-HCl method by Burns (1971)**,** Vitamin A (Eitenmillar and Landen, 1998), Vitamin B_3 and C (Sadasivam and Manickam, 1992) was carried out, Organic carbon by Walkley and Black (1943), and photosynthetic pigments like chlorophyll *a, b,* total chlorophyll and carotenoids by Arnon (1949) as modified by Harborne (1973) method, anthocyanins (Vivekanadan, 1991), and ß Carotene by AACC (1995) methods are followed.

Results

Physicochemical analysis

The physicochemical parameters are mainly used in judging the purity and quality of the drug. In this study, Quantification of physicochemical parameters such as moisture content, total ash value, acid insoluble ash value, water soluble ash value, different solvent (petroleum ether, benzene, chloroform, acetone and methanol) extractive value and crude fibre were showed in Table 1. The moisture content, total ash value, acid insoluble and water soluble ash value of G. *fergusonii* was *24.6*±0.324%, 36.61±0.69%, 24.24±0.19%, and 26.69±0.02% were respectively. Ash analysis showed high mineral contents that might be the result of the absorption of inorganic salt from seawater or of the association of cations with algal polysaccharides (Lahaye, 1991). Then the solvent extractive value like petroleum ether, benzene, chloroform, acetone, methanol and water was 0.40±0.01%, 0.55±0.02%, 0.25±0.02%, 0.27±0.008%, 1.66±0.05% and 4.24±0.03% respectively. Extractive value is useful for the evaluation of a crude drug as it gives idea about the nature of chemical constituents present in it and is useful for estimation of chemical constituents, soluble in that particular solvent used for extraction (Lincy and Mathew, 2011).

The physicochemical results suggest that the seaweed have high extractive value in methanol and water extract than that of other extract. Seaweeds were rich in dietary fiber (>50% dry weight), particularly in the soluble form (Mabeau and Fleurence, 1993). The crude fiber content of *G. fergusonii* was 87.8±1.485% recorded. The consumption of dietary fibers and plant cell walls containing such fiber components protects human organisms against a number of chronic diseases e.g., colon cancer (Guidel and Goni, 2002).

Biochemical Analysis

The nutritional value of a food depends on its chemical composition such as carbohydrates, proteins, lipids, sugars, and also the minerals present in them. Knowledge of the chemical composition of marine macro algae is important for the nutritional value and evaluation of potential sources of protein, carbohydrate and lipid for commercial use or for possible human consumption (Chapman and Chapman, 1980). Biochemical such as carbohydrate, protein, amino acid, lipid, total free phenols, tannins, organic carbon, vitamin A, B_3, C, pigment analysis such as estimation of anthocyanin, ß Carotene, chlorophyll *a, b*, total chlorophyll and carotenoids were determined present in Table 2 and 3. Carbohydrates are the most abundant substances in most seaweeds, since they occur in cell wall (ex.: agar, cellulose) and as storage products (ex.: starch, laminaran). The dry weight of primary metabolites carbohydrate contain 0.160±0.014mg/g, protein was 0.62±0.03 mg/g, amino acid was 0.257±0.0015 mg/g and lipid was 0.373±0.003 mg/g were present in red algae *G. fergusonii*. Carbohydrate is one of the important components for metabolism and it supplies the energy needed for respiration and other most important processes. Edible seaweeds contain significant quantities of protein, lipids, minerals and vitamins (Norziah and Ching, 2002). The secondary metabolites like total free phenols and tannins were 3.08±0.022 and 0.473±0.029 mg/g respectively. The organic carbon content of *G. fergusonii* was 2.331±0.016mg/g recorded. Whereas vitamins like A, B_3, and C content via 54.31±0.27, 50.81± 0.89 and 3.790± 0.431 were respectively.

The photosynthetic pigments like chlorophyll *a*, chlorophyll *b*, total chlorophyll, carotinoids, fresh weight content of red algae *G. fergusonii* was 0.088±0.008 mg/g, 0.127±0.011 mg/g, 0.219±0.016 mg/g, 56.33±1.08mg/g, and dry weight content of anthocyanin and ß Carotene was 0.0133±0.002 mg/g, and 0.851±0.009 mg/g were respectively. Many studies have been performed worldwide to characterize algae species according to their chemical composition (Norziah and Ching, 2002, Abdallah *et al.*, 2006 and Kamenarska *et al.*, 2002). Marine resources offer important bioactive molecules that have advantages on the human body. They can be applied in many fields such as the drug, cosmetic, and food industries. Functional foods can easily be developed from marine products since they are widely available and they have the ability to prevent certain diseases and cure some illnesses.

Table 1: The weight percentage of moisture content, ash values, different solvents soluble extractive values and crude fibre of red algae *G. fergusonii*

Sample	*Gracilaria fergusonii*
Moisture content%	24.6±0.324
Total ash %	36.61±0.69
Acid insoluble ash %	24.24±0.19
Water soluble ash %	26.69±0.02
Petroleum ether %	0.40±0.01

Benzene %	0.55±0.02
Chloroform %	0.25±0.02
Acetone %	0.27±0.008
Methanol %	1.66±0.05
Water %	4.24±0.03
Crude fibre % (dry wt.)	87.8±1.485

The results are expressed as mean value ± standard deviation

Table 2: Estimation of biochemical compositions of powdered drug G. *fergusonii* (dry wt)

Sample	*G. fergusonii*
Carbohydrate (mg/g dry wt)	0.160±0.014
Protein (mg/g dry wt)	0.62±0.03
Amino Acid (mg/g dry wt)	0.257±0.0015
Lipid (mg/g dry wt)	0.373±0.003
Total free Phenols (mg/g dry wt)	3.08±0.022
Tannins (mg/g dry wt)	0.473±0.029
Organic Carbon % (dry wt)	2.331±0.016
Vitamins A (mg/100g dry wt.)	54.31±0.27
Vitamins B_3 (mg/100g dry wt.)	50.81±0.89
Vitamins C (mg/100g dry wt.)	3.790±0.431

The results are expressed as mean value ± standard deviation

Table 3: Estimation of photosynthetic pigments analysis of G. *fergusonii*

Sample	*G. fergusonii*
Chlorophyll *a* (mg g^{-1} fr. wt)	0.088±0.008
Chlorophyll *b* (mg g^{-1} fr. wt)	0.127±0.011
Total Chlorophyll (mg g^{-1} fr. wt)	0.219±0.016
Carotinoids (mg g^{-1} fr. wt.)	56.33±1.08
Anthocyanin (mg/g dry wt)	0.0133±0.002
ß Carotene (mg/g dry wt)	0.851±0.009

The results are expressed as mean value ± standard deviation

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