ISSN: 0975-766X
CODEN: IJPTFI
Available Online through
www.ijptonline.com
Research Article

EXPERIMENTAL INVESTIGATION ON *KAPPAPHYCUS SP.* THROUGH ESTIMATION OF MINERALS

P. Rajasulochana*, P. Krishnamoorthy[@] and R. Dhamotharan**
*Lecturer Dept .Bioinformatics, Bharath University, Chennai, India.
** Reader, Dept. Plant Biology & Plant Biotechnology, Presidency College, Chennai, India.
[@] Professor and Dean, Dept. Bioinformatics, Bharath University, Chennai, India.
Email: prs_nellore@yahoo.com

Received on 10-11-2012 *Accepted on 24-11-2012*

Abstract

This paper deals with the estimation of various minerals present in *kappaphycus sp*. Sample was collected from the sea coast of Rameshwaram, Tamil Nadu, India in the form of wet and living sample. Macrominerals were identified by using flame atomic absorption spectrophotometry and it was found that red algae (*kappaphycus sp*.) contain various amounts of macrominerals such as Sodium (23.4 mg), Potasium (12.44 mg), Magnesium (23.56 mg), Phosphorous (19.5 mg) per 100mg and rich in calcium (3.565 gm/100 gm). The studies showed that red seaweeds could be used as a food supplement to meet the recommended daily intake of some essential minerals. From the overall study, it can be concluded that the *K. alvarezii* can serve as functional food with vital nutritional and biological values.

Key words: Red algae, *k.alvarezii*, Macrominerals, Biological values.

1. Introduction

Marine organisms are a rich source of structurally novel and biologically active metabolites. Secondary or Primary metabolites produced by these organisms may be potential bioactive compounds of interest in the pharmaceutical industry. Microalgal metabolites have attracted attention for two main reasons, first, because they are the source of toxins in harmful algal blooms and secondly because they are a potentially rich source of new drug candidates. Commercially available varieties of marine macroalgae are commonly referred to as seaweeds. Seaweeds of the marine macrophytic algae are an assemblage of the members of Chlorophycease, Phaeophycease and Rhodophycease and, are the common inhabitants of the tidal and inter-tidal environments of the marine ecosystem. Seaweeds have been widely used for human consumption in many parts of the world. In general marine algae

contains (i) protein with all the essential amino acids-unlike most plant foods (ii) a high carbohydrate content (iii) an extensive fatty acid profile, including Omega 3 and Omega 6 and (iv) an abundance of vitamins, minerals and trace elements in a naturally-occurring synergistic design. Macroalgae can be classified as red algae (*Rhodophyta*), brownalgae (*Phaeophyta*) or green algae (*Chlorophyta*) depending on their colour, nutrient and chemical composition. Red and brown algae are mainly used as human food sources. Seaweed species are rich in beneficial nutrients, in countries such as China, Japan and Korea, they have been commonly utilized in human alimentation.

Seaweeds have been consumed in Asia since ancient times. Further, marine algae have been utilized in Japan as raw materials in the manufacture of many seaweed food products, such as jam, cheese, wine, tea, soup and noodles and in the western countries, mainly as a source of polysaccharides for food and pharmaceutical uses [1-3]. In Europe, there is an increasing interest in marine seaweeds as a food, nevertheless, at present there are no European union specific regulations concerning their utilization for human consumption. Ke Li et al. [4] determined various chemical constituents of the red alga *Grateloupia turuturu.* Few seaweeds such as laminaria, focus are used as cattle feed and or believe to be good source of trace elements to animals. Protein content in these algae is high. However, metabolizable carbohydrates are much less. Marine algae can serve as a source of minerals, vitamins, free amino acids and poly unsaturated fatty acids.

The determination of lipid composition in a given species is essential for further studies on lipid metabolism and on the effect of environmental factors. Lipid profiles assist the assignment of algal taxonomic position, and also provide signature lipid profiles for use in organic geochemistry and food web studies. Such biochemical analyses may also prove useful in studying the abundance and ecology of these species in marine environments. From chemotaxonomic point of view lipids e.g. fatty acids and sterols provide interesting information for taxonomic purposes. Whereas higher plants have received extensive attention regarding lipid content, benthic algae have received relatively little attention and our knowledge is still rather poor. Some papers, however, have been published on the Rhodophyta lipid area, but the classification was confused, as in some cases especially, large variations occurred in the fatty acid or in the sterol composition within the same genera or sometimes within the same species. The use of algal oils containing long chain polyunsaturated fatty acids as nutritional supplements has been recommended and algal sources are being identified for the presence of docosahexaenoic acid and eicosapentaenoic acid. These fatty acids are involved in the regulation of neurological, coronary and reproductive

physiology in humans. They are conditionally essential nutrients during infancy and a number of nutritional and professional organizations including world health organistion have recommended the inclusion of these fatty acids in infant nutritional formula [5-7].

In general, from the critical review of literature, it is observed that the most of studies on the nutrient contents of seaweeds have concerned fresh plants. Little is known of the effects of processing by drying or canning. The present investigation aims at on the estimation of mineral composition from *Kappaphycus sp.*

2. Materials and Methods

Sample was collected from the sea coast of Rameshwaram, Tamil Nadu, India in the form of dry and living material. Algae samples were cleaned and removed from epiphytes and necrotic parts. Samples were rinsed with sterile water to remove any associated debris. Sample was kept under sunshade for 7 days. After drying the sample, it was ground thoroughly to powder form. The powder was then used for the estimation of minerals. This powder was stored in cold conditions in an airtight container and analysis was carried out within three months of processing.

Shade dried powdered material of the experimental algae were used in the investigations unless otherwise mentioned. Wet weight and dry weight estimations were made from the samples of alga *vide* Materials and Methods.

2.1 Estimation of minerals

Mineral analysis or elemental analysis of the shade dried powdered samples of the experimental alga was carried out following the procedures outlined in PERKIN-ELEMER'S Atomic absorption spectrophotometry. Known quantity of the shade dried powdered samples of the experimental algae was taken in a beaker and soaked overnight in conc. HNO_3(0.5 ml for 1.0 g of algal material). To the soaked sample, 2.0 ml of 70% per chloric acid was added and heated in an electrothermal bunsen after covering the mouth of the beaker with a watch glass till the volume was reduced to 3.0 ml. To this, 10.0 ml of glass distilled water was added, mixed well and filtered into a 100 ml standard volumetric flask. After cooling, the volume was made up to 100 ml with glass distilled water.

The standard working conditions for the analysis of typical minerals are given below:

Calcium

Wave length	:	422.7 nm
Slit setting	:	0.7 nm

Light source	:	Calcium hollow cathode lamp
Flame type	:	Air –Acetylene flame

Magnesium

Wave length	:	285.2 nm
Slit setting	:	0.7 nm
Light source	:	Magnesium hollow cathode lamp
Flame type	:	Air –Acetylene flame

Sodium

Wave length	:	589.0 nm
Slit setting	:	0.7 nm
Light source	:	Sodium hollow cathode lamp
Flame type	:	Air –Acetylene flame

Potassium

Wave length	:	766.5 nm
Slit setting	:	2.0 nm
Light source	:	Potassium hollow cathode lamp
Flame type	:	Air –Acetylene flame

Copper

Wave length	:	324.8 nm
Slit setting	:	0.7 nm
Light source	:	Copper hollow cathode lamp
Flame type	:	Air –Acetylene flame

Iron

Wave length	:	248.3 nm
Slit setting	:	0.2 nm
Light source	:	Iron hollow cathode lamp
Flame type	:	Air –Acetylene flame

Cobalt

Wave length	:	240.7 nm
Slit setting	:	0.2 nm
Light source	:	Cobalt hollow cathode lamp
Flame type	:	Air –Acetylene flame

Manganese

Wave length	:	279.5 nm
Slit setting	:	0.2 nm
Light source	:	Manganese hollow cathode lamp

Flame type	:	Air –Acetylene flame
Zinc		
Wave length	:	213.9 nm
Slit setting	:	0.7 nm
Light source	:	Zinc hollow cathode lamp
Flame type	:	Air –Acetylene flame
Cadmium		
Wave length	:	288.8 nm
Slit setting	:	0.7 nm
Light source	:	Cadmium hollow cathode lamp
Flame type	:	Air –Acetylene flame
Lead		
Wave length	:	283.3 nm
Slit setting	:	0.7 nm
Light source	:	Lead hollow cathode lamp
Flame type	:	Air –Acetylene flame

2.2 Results & Discussion

The minerals identified in *Kappaphycus sp.* are shown in Table 1. From Table 1, it can be noted that Calcium is the major constituent of algae and formed the bulk of total minerals. The next major constituent is magnesium and sodium. Fluoride is the least mineral product of this algae. It can be noted that Na/K ratio is below 2.0 which is interesting from the point of view of nutrition, since the intake of sodium chloride and diet with a high Na/k ratio have been related to the incidence of hypertension. Further, it can be observed that the mineral content available in *Kappaphycus sp.* for human consumption is well within the limits (1.5-10 mg/100g) [2]. In general, algal product would supplement the daily intake of some trace elements for adults: Fe, 10-18 mg; Zn, 15 mg; Mn, 2.5-5 mg and Cu, 2-3 mg [2].

Ruperez [8] estimated mineral content in several brown & red edible marine seed vegetables. According to him, seaweeds contained high proportions of ash (21.1– 39.3 %) and sulphate (1.3 – 5.9%). In brown algae, ash content (30.1-39.3%) was higher than in red algae (20.6 – 21.1%). Atomic absorption spectrophotometry of the ashes indicated that marine seaweeds contained high amount of both macro minerals (8.083-17.875 mg/100g, Na, K, Ca, Mg) & trace elements (5.1 – 15.2 mg/100g, Fe, Zn, Cu, Mb), than those reported for edible land plants. In the present study, it was identified that Ca is the major mineral. Fayaz et al. [9] used the ash sample for the

estimation of mineral elements (Calcium, iron, Zinc) by Association of analytical communities (AOAC) procedure. The concentrations of the elements in *K. alvarezii* were determined with atomic absorption spectrophotometry. Triplicate determinations for each element were carried out. The concentration of the elements was determined from calibration. It was observed that *K. alvarezii* contains calcium, 159.5, iron, 33.8 and zinc, 1.58 mg/100g of the sample. The presence of significant amounts of calcium and iron in *K. alvarezii* may be due to its metabolic system in which it is capable of directly absorbing elements from the sea water. Dhamotharan [10] estimated various mineral content available in *stoechospernum marginatum and padina.* He observed that the total concentration of the minerals was always high in *padina* (7244.0 µg/g dry wt.) as compared to that in *s. marginatum* (3091.0 µg/g dry wt). Ca was the major constituent of both algae and formed the bulk of total minerals. Similar observation was made in the present investigation. Ca levels in padina amounted to 87.0% of the total minerals while the same in stoecho was 66.0%. The next major constituent in these algae is iron. The iron content in *stoechospernum* was 27.0% of the total mineral content and in *padina* it amounted to 10.0%.

Table-1: Various minerals identified in *Kappaphycus alvarezii.*

Minerals	**mg/kg**
Sodium	23.4
Potassium	12.44
Calcium	3.565 gm
Magnesium	23.56
Phosphorus	19.5
Iron	7.89
Copper	0.897
Zinc	1.464
Manganese	0.44
Molybdenum	0.677
Fluoride	0.056

3. Summary and Concluding Remarks

Sample was collected from the sea coast of Rameshwaram, Tamil Nadu, India in the form of wet and living sample. Material methods for typical chemical constituents have been followed. Macrominerals were identified by using flame atomic absorption spectrophotometry and it was found that red algae contained various amounts of macrominerals such as Sodium (23.4 mg), Potasium (12.44 mg), Magnesium (23.56 mg), Phosphorous (19.5 mg) per 100mg and rich in calcium (3.565 gm/100 gm). The studies showed that red seaweeds could be used as a food supplement to meet the recommended daily intake of some essential minerals. From the overall study, it can be concluded that the *K. alvarezii* can serve as functional food with vital nutritional and biological values.

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Corresponding Author:

P. Rajasulochana*,

Email: *prs_nellore@yahoo.com*