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Research Article

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Experimental studies to determine various vitamins available in *Kappaphycus alvarezii*

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ABSTRACT

This paper presents the details of experimental studies carried out on Kappaphycus sp. To determine various vitamins. Sample was collected from the sea coast of Rameshwaram, Tamil Nadu, India in the form of dry and living sample. Standard material methods have been followed for estimation of vitamins available in Kappaphycus sp. The compositions of vitamin C, vitamin E, selenium and magnesium were found to be 0.123gm, 0.243gm, 0.0012gm, 0.0245gm per 100 gm respectively. From study of vitamins, it was observed that the quantity of vitamin A is 1355.6 IU. Folic acid content is 1.22µg and choline is 0.676µg. Vitamins B1, B2, B3 and B6 are present in lesser quantity. B5 and B12 were observed to be in traces. From the overall study, it can be concluded that the species can serve as functional food with vital nutritional and biological values.

Keywords: Red algae, *Kappaphycus*, vitamins, nutritional

INTRODUCTION

Seaweeds have been widely used for human consumption in many parts of the world. Marine algae can serve as a source of minerals, vitamins, free aminoacids and polyunsaturated fatty acids. Macroalgae can be classified as red algae (*Rhodophyta*), brownalgae (*Phaeophyta*) or green algae (*Chlorophyta*) depending on their 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*.

Ascorbic acid (vitamin c) is an essential nutrient required to maintain normal physiological functions in animal cells. It is generally believed that the ability to synthesize ascorbic acid is absent in some animals including invertebrates and fishes due to the lack of L-gulonolactone oxidase that catalyzes the terminal step in the conversion of glucose to ascorbic acid [5]. A dietary requirement for vitamin C has been reported for a no. of species of crustaceans [6]. Abalone are large algivorous marine molluscs of the genus, *Haliotis*. They are the most commercially important gastropods in aquaculture. It has been reported that an increased level of vitamin C was incorporated into abalone feeds. A vitamin mixture including vitamin C, usually a commercial product or experimental formulation similar to that for other aquatic animals, is generally supplemented to test diets for abalone at a level of 1.5-2.5% [7, 8].

In general, from the critical review of literature, it has been observed that the most 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 evaluation of various vitamins available in *Kappaphycus sp.*

EXPERIMENTAL SECTION

Sample was collected from the sea coast of Rameshwaram, Tamil Nadu, India in the form of dry and living sample. Algae samples were cleaned at epiphytes and necrotic parts were removed. 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 chemical constituents such as heavy metals, lipids, phenol, vitamins, carrageen, carbohydrates, antioxidants. This powder was stored in cold conditions in an airtight container and analysis was carried out within three months of processing. Typical procedure is outlined for estimation of vitamin E.

Assay for vitamin E (USP reference standard)
Mobile phase Dilute 10 ml of phosphoric acid with water to 1000 ml to obtain solution A. Prepare a filtered and degassed mixture of methanol and solution A (95:5). Make adjustments if necessary.

Standard preparation Dissolve an accurately weighed quantity of USP Alpha Tocopherol RS, USP Alpha Tocopheryl Acetate RS, or USP Alpha Tocopheryl Acid Succinate RS in methanol, and dilute quantitatively with methanol to obtain a solution having a known concentration of about 2 mg per ml.

System suitability preparation Dissolve an accurately weighed quantity of USP Ergocalciferol RS in methanol, and dilute quantitatively, and stepwise if necessary, with methanol to obtain a solution having a concentration of 0.65 mg per ml. Transfer 1.0 ml of this solution to a 100-ml volumetric flask containing about 100 mg of USP Alpha Tocopheryl Acetate RS, accurately weighed. Dissolve in 30 ml of methanol, with the aid of sonication if necessary, dilute with methanol to volume, and mix. Store this solution in a refrigerator.

Chromatographic system The liquid chromatograph is equipped with a 254-nm detector and an 8-mm × 10-cm column that contains 5-µm packing L1. The flow rate is about 2 ml per minute. Chromatograph the System suitability preparation, and record the peak areas as directed for.

Procedure: the relative retention times are about 0.5 for ergocalciferol and 1.0 for alpha tocopheryl acetate; the resolution, R, between ergocalciferol and alpha tocopheryl acetate is not less than 12; and the tailing factor is between 0.8 and 1.2. Chromatograph the Standard preparation, and record the peak areas as directed for.

Procedure: the relative standard deviation for replicate injections is not more than 3.0%. Separately inject equal volumes (about 100µl) of the Standard preparation and the Assay preparation into the chromatograph, record the chromatograms, and measure the peak areas. Calculate the quantity, in mg, of alpha tocopherol ($C_{29}H_{50}O_2$), alpha tocopheryl acetate ($C_{31}H_{52}O_3$), or alpha tocopheryl acid succinate ($C_{33}H_{54}O_5$) in the portion of powder taken by the formula:

CD(r U / r S)

in which C is the concentration, in mg per ml, of the corrresponding USP Reference Standard in the standard preparation; D is the dilution factor, in ml, for the assay preparation; and r U and r S are the peak responses for the relevant vitamin E form obtained from the assay preparation and the standard preparation, respectively. Calculate the alpha tocopherol equivalent of alpha tocopheryl acetate or alpha tocopheryl acid succinate by multiplying the content, in mg, by the factor 0.91 or 0.81, respectively used to prepare the assay preparation.

Similar procedure can be adopted for estimation of other vitamins, namely, B1, B2, C, B6 and B12.

RESULTS AND DISCUSSION

Results obtained for various vitamins in *Kappaphycus sp.* are shown in Table 1. Statistical distribution was carried out and standard deviation (SD) is estimated and is also shown in Table 1 against each constituent.

Table 1 Various vitamins of *Kappaphycus sp.*

Vitamin	Composition	SD
Vitamin C	0.123gm/100mg	0.123±0.02
Vitamin E	0.243gm/100mg	0.243±0.015
Vitamins/100mg		
Vitamin A	1355.6 IU	
Vitamin B1	7.7 µg	7.7±0.03
Vitamin B2	0.121 µg	0.121±0.01
Vitamin B3	12.6 µg	12.6±0.02
Vitamin B6	0.221 µg	0.221±0.03
Folic acid	1.22 µg	1.22±0.01
Choline	0.676 µg	0.676±0.01
Vitamin B5 Vitamin B12	In traces	In traces

From Table 1, it can be noted that the content of vitamin A available in *Kappaphycus* is 1355.6 IU. Folic acid content is 1.22 µg and Choline is 0.676µg. Vitamins B1, B2, B3 and B6 are in lesser quantity. B5 and B12 were observed to be in traces. Kangsen Mai [9] reported that survival and growth of abalone species such as *Haliotis tuberculata L and Haliotis discus hannai* were not significantly affected by the dietary treatments (P>0.05); and no deficiency signs were observed. The vitamin mix without vitamin C in the *H. hannai* were found in the following manner: Thiamin HCl, 0.6g; Riboflavin 0.5g; Folic acid 0.15g; PABA 2.0g; Pyridoxine HCl 0.2 g; Niacin 4.0g; Ca pantothenate 1.0g; Inositol 20.0g; Biotin 60mg; Vitamin E 2.25 g; Menadione 0.4 g; B12 900 µg; Vitamin A 500000 IU; Vitamin D 10000 IU. Fayaz et al [10] carried out studies on chemical composition, iron bioavailability, and antioxidant activity of *Kappaphycus alvarezii* (Doty). It was found that the content of ascorbic acid in *K. alvarezii* was 107.1mg/100g dry wt and Beta-carotene was 5.26mg/100g sample dry weight. In the present study, it was found that ascorbic acid is 12.3 mg/100gm. Dhamotharan [11] conducted experiment to estimate b1, b2 and b6 on the dried samples of *stoechospernum marginatum and padina*. The vitamins nicotinic acid, b6, b1and b2 were detected in the dried samples of the exp. alga and vit b6 was found to be present in huge quantities in both algal samples. Tissues of padina have nearly two fold greater levels of this vitamin than stoech. However, the levels of other three vitamins were high in stoech as compared to padina. In the case of red algae (*Kappaphycus* sp.) also the vitamins, b6, b1 and b2 were detected.

CONCLUSION

Various vitamins were estimated from *Kappaphycus sp*. Sample was collected from the sea coast of Rameshwaram, Tamil Nadu, India in the form of dry and living sample. Typical method has been described to estimate the vitamin. From study of vitamins, it was observed that the quantity of vitamin A is 1355.6 IU. Folic acid content is 1.22µg and choline is 0.676µg. Vitamins B1, B2, B3 and B6 are present in lesser quantity. B5 and B12 were observed to be in traces. From the thel study, it can be concluded that the species can serve as functional food with vital nutritional and biological values.

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