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Nutritional Composition of *Ulva lactuca* for Human Consumptions

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Abstract

The nutritional evaluation of protein, carbohydrate, lipid and mineral from the seaweed *Ulva lactuca* has been carried out. The present study is to know the nutritional ingredient of the seaweed *Ulva lactuca* for utilization in human nutrition in the future. Results show that carbohydrate was the major ingredient in the proximate analysis of *U.lactuca* in the present work. The carbohydrate content was 18%, protein was 14% and lipid was 2.9%. The mineral content was analyzed in this study Zinc, Magnesium, Calcium and Manganese content are 0.459 mg/L, 0.233 mg/L, 0.002 mg/L and 0.001 mg/L respectively. The chemical composition of *U. lactuca* indicates that it has a good potential for its use in human food.

Keywords: *Ulva lactuca*, Nutritive value, Protein.

Introduction

Seaweeds are macroscopic algae which are found in shallow sea waters. They grow in the intertidal, shallow and deep sea region up to 180 meter depth and also in estuaries and back waters on the solid substrate such as shells, pebbles, dead corals, rocks and other materials (Anantharaman, 2002). Three dominant group of Seaweed growing in the coastal region they are belonging to Chlorophyceae -green algae, Phaeophyceae-brown algae and Rhodophyceae-red algae (Nirmal kumar, 2009).

Seaweeds have been used as nutrition, agriculture, industries such as food, confectionary, textiles, pharmaceuticals, dairy and paper industries mostly as gelling, stabilizing and thickening

agents. They are also used for animal and human consumption, as soil manure, salt extractions, in several countries. Some varieties of seaweed used or indicated as biomonitors to study the environmental contamination (Caliceti *et al.*, 2002).

Seaweed *Ulva lactuca* belongs to the Chlorophyceae (green seaweed) and could grow under various ranges of temperature and salinity. Its morphological characteristics are changed in accordance with environmental changes. Ulva sp. is found in almost shallow coastal waters of all country and is able to live in sub-tropic and tropical regions, which makes it to be recognized as a cosmopolitan algae. This algae is considered as a fast growing algae. It is suggested that *U. lactuca* is feasible to be cultivated. In several tropical areas, emergence of blooming Ulva sp. or green tides was reported due to overgrowth of Ulva sp., causing the reduction of biodiversity (Buapet et al 2008). *Ulva lactuca* is a good source of nutritional food it consist of minerals and vitamins, and is especially rich in vitamin C (Garcia-Casal *et al*., 2007).

The aim of the present work was to study the lipid, protein, carbohydrate and mineral composition of the *Ulva lactuca* which represent natural resource with potential economic value for use in human and animal nutrition.

Material and methods

Study site

Selected seaweed species *Ulva lactuca* collected from Mandapam region of Gulf of Mannar area. Mandapam is situated (Lot. 9^0 17’ N, Lon. 79^0 8’ E) on a narrow tongue of land project from the Southern part of the East coast of India. Rameshwaram is located (Lat. 9^0 17’ N, Lon. 79^0 18’ E) in the state of Tamil Nadu, is an island separated from the mainland by the channel of Pamban. It is almost 40 km away from the Peninsula of Jaffna in Sri Lanka. The sample taken were washed in running water and freeze dried. The dried sample was used for the analysis of nutrional composition and toxicity studies.

Sampling and biomass estimation

Ulva lactuca (Chlorophyceae) was collected and then brought to the laboratory in dark plastic bags. In addition, several samples of drift algal species were cautiously collected and transported to laboratory in dark plastic bags. The collected samples were identified, washed with distilled

water to remove epiphytes and impurities and weighed. The algal samples were dried at oven (60^0C) till constant weight. The dried samples were weighted and ground into a fine powder. All chemical analyses were conducted in dried ground material. All values were reported relative to the dry weight of the seaweed.

Total protein analysis

The lowry method (Lowry *et al*., 1951) was used for protein determination. The algal samples were digested in 1N NaOH, and then allowed to react with an alkaline copper citrate solution and Folin-Cioalteau phenol reagent. The protein content was determined by measuring the absorption at 660 nm using bovine serum albumin as standard.

Soluble carbohydrate content

Soluble carbohydrates were extracted from algal samples in 5% trichloroacetic acid, and the concentrations were determined by using the phenolic sulfuric acid colorimetric method outlined in Dubois *et al*., (1956). Percent of soluble carbohydrate was calculated based on absorption at 490 nm using spectrophotometer, and compared to glucose as standard.

Crude lipids analysis

Crude lipid was extracted from algal samples in a chloroform-methanol (2:1, v/v) mixture, then purified and evaporated to dryness and weighted according to the method described in Chan *et al*. (1997).

Mineral Analysis

Minerals content (Iron, Magnesium, Zinc, Lead, calcium and Manganese) content was determined by the standard AOAC method (2000).

Results and Discussion

The seaweed *Ulva lactuca* collcted from Mandapam waters was studied for proximate, minerals analysis. Proximate analysis was done for protein, lipid and carbohydrate values of which were found to be 14%, 2.9%, 18%, (dry weight basis) respectively (Table. 1). The high protein value was observed but low fat value was observed in *Ulva lactuca*. The carbohydrate is contributed

high value in *Ulva lactuca*. The mean protein content of selected seaweeds was within the range of 10-47% for green and red seaweeds reported by Flurrence (1999). The mean percentage of protein obtained from *Ulva lactuca* were lower than the some edible red algae; eg. *Gracillaria cervicornis* (22.96%), *Hypnea japonica* (19.00%), *Hypnea musciformis* (18.64%) and *Porphyra tenera* (34.20%). The levels of protein probably varied depending on seasonal and environmental variation (e.g. salinity, temperature, dissolved oxygen and dissolved nutrient). The protein content of seaweeds varies not only between the species but also between habitats, levels of maturity and time of the month and year (Zucchi and Necchi 2001; Stirk *et al*. 2007).

Carbohydrates were the one of the important component in the proximate composition of the seaweeds investigation in the present work. The carbohydrate range is 18 % (dry weight basis) in *Ulva lactuca*. These results were comparatively higher than those results by Hind *et al*. (2014) for *Ulva lactuca* (17.5%), and Garcia *et al.* (2016) reported in *Ulva lactuca* (11.5%). Carbohydrate is the most important component for metabolism as it supplies the energy needed for respiration and other metabolic processes (Khairy and El-Shafay, 2013).

The lipid content was examined in this study, 2.9%. This result lower than reported by Riza et al. (2015) was 2.2%, Pattama and Anong (2011) was 0.86% and Abdel-Wahab *et al.* (2016) was 1.40%. Apparently, the fat content of U. lactuca are relatively in low. Based on the result found in this study and the previous reported show that U. lactuca can be regarded as an alternative source of a healthy food for human which has high protein but low in fat.

The mineral composition examined in this study is shown in Table 2. Iron content was 1.689 mg/L higher than other minerals. Zinc, Magnesium, Calcium and Manganese content are 0.459 mg/L, 0.233 mg/L, 0.002 mg/L and 0.001 mg/L respectively. The minerals composition and concentration are species and location specific because seaweeds are able to selectively absorb minerals' from the surrounding seawater and accumulate them in their thalli (Abdullah, 2017).

Table 1: Proximal composition of *Ulva lactuca*.

Biochemical components	***Ulva lactuca* powder (gm/100 gm dry weight)**
Carbohydrate	18%
Protein	14%
Lipid	2.9%

Table.2: Mineral compositions of *Ulva lactuca* seaweed extract

Name of the elements	**Observed concentration (mg / L)**
Iron	1.689
Magnesium	0.233
Lead	0.001
Zinc	0.459

Conclusion

Seaweed is a foodstuff that has been historically consumed around the globe but is only consumed in appreciable amount in certain areas of the world today. Previous research would suggest that incorporation of whole seaweeds and seaweed polysaccharides in to foods is generally acceptable to the consumer. Seaweed or seaweed isolate enrichment may not only benefit the nutritional value of a food product. As such, nutrition or health researchers should collaborate early on with food technologists food industry in order to design and develop suitable appealing products with these ingredients.

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