The Contents of Major Pigments and Solvent Effectiveness of Edible Seaweed Species Available in Sri Lanka

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Abstract

The correct type of solvent in the extraction method is specific in the natural materials. It is important to have quality of pigments, and therefore, optimum quality beneficial to the society can be produced. The five varieties of seaweeds were collected from North east and South west coastal belt of Sri Lanka. The dried and ground seaweed species were extracted using different solvents. The solvents used for extraction of pigments were ethanol, methanol, acetone and diethyl ether and seaweed color levels brown (*Sargussum wighitti)*, green and red. Research results indicated that each solvent reach a peak of maximum value 27.8 - 40.98 μg/g namely Chlorophyll a and b in green and brown algae. The Carotenoids were also given maximum value 2486 μg/g in red algae species. The usage of methanol and acetone solvent gave the best results pigment quality. The highest DPPH free radical scavenging activities of digests were maximum 6.5 μM at *Sargussum* species in Methanol extraction.

Key words: Carotenoid pigments, Natural colors, Chlorophyll, Extraction, Antioxidant activity

Introduction

The importance of marine algae as source of natural pigment has been well recognized due to their valuable beneficial effect in food, feed and Pharmaceuticals. It has wide variety of colours from green to yellow green, gray, red and brown indicating photosynthetic pigments such as chlorophyll and Carotenoids. Solvent is an important factor in the effectiveness of pigments extraction.

Seaweeds are broken in to different categories according to their colors, such as blue, green and brown and red seaweeds. Color is an important characteristic of food, and their colors could be used for food coloring. According to seaweed of brown, green and red, till aquamarine color contain many pigments of carotenoids.

Pigments such as carotenoid (fucoxanthin) could even provide a new functional food and cosmetic ingredients with anti-metabolic syndrome activity anti-obesity, anti-diabeties, including antioxidants besides, providing anti-obesity, anti-inflammation effect and Low risk for breast cancer, poster cancer cells and diminishing risk of cardio-vascular disease.

Carotenoid pigments are one of fat- soluble pigments. For that, the maximization of the extraction process must use the solvent of fat, such as acetone, ethanol, diethyl either and methanol preparations. The extraction process with two kinds of solvents of fat could have given different results. Solvents of extraction process are effective if it is capable of producing pigments of high quality and quantity. The present study conducted on evaluation of solvent types of extraction carotenoids and chlorophyll a and b with high yield and quality.

Materials and Methods

Sample collection

The five different seaweed varieties *Gracilaria vericosa* (brown seaweed) , *Sargussum wightti,* Sargussum species, *Kappuphycus species* (raw seaweed) and *Ulva species* (green seaweed) were collected from North eastern and South west coastal belt of Sri Lanka and transported to the laboratory keeping in the insulated box. The seaweeds were dried, ground and stored in the freezer at 0 °C, until used for color separation. The carotenoid and chlorophyll pigments were extracted

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by weighing 30 g of seaweed samples and they were dissplved by organic solvents with a ratio 1:5 (acetone, methanol, diethyl ether, ethanol). Then stirred with magnetic mixer for 3 hours and filtered using cotton wool. The pigment filtrate was utilized for chlorophyll estimation absorbance was read at 666, 662, 664, 653, and 645, nm in UV spectrophotometer (Sikran *et al.*, 1998). The carotenoids were estimated 400, 440, and 470 nm in UV spectrophotometer (Waroyo, 1949). The radical scavenging activity was determined by DPPH used modified method of Brand-Williams *et al.* (1995).

Results and Discussion

The major photosynthetic pigments, total chlorophyll and carotenoids contents were estimated from fresh seaweeds. The total chlorophyll. A content ranged from (0.2234 - 20.8) µg/g with minimum in the red seaweed *Gracilaria verucosa* and maximum in green seaweed *Ulva* species. The total carotenoid content also ranged from 109.16-2417 µg/g with minimum in the red seaweed and maximum in green seaweed (*Ulva species*) in methanol. The DPPH scavenging activity 6.5 µM was highest in *Sargussum* species. The analysis of algal pigments depends on the selection of appropriate extraction procedure. The results of the present study was in agreement with Warkoyo *et al.* (2011) who noted that highest extraction efficiency is generally achieved using methanol. However, the stability of pigments in methanol is low. Acetone is known to have a lower extractability of chlorophylls from the protein matrix. The acetone can provide stable environment. While acetone and methanol have the same polarity index, acetone has greater eutrophics strength than methanol for carbon-rich substrates (Stock and Rice, 1967).

According to the results obtained in the study, chlorophyll content and carotenoids in chlorophyta were highest in Ulva species in all the solvent. Pigment content was influence by environmental parameters. Methanol extraction of seaweed in each solvent reached a peak of maximum absorbance in accordance with specific characteristic of pigments. The overall usage of acetone and ethanol also gave better pigment quality. In accordance with study, stating the methanol gave the best results of the pigment extraction. However, acetone and ethanol can be considered the best solvent for processing food from the viewpoint of safety.

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