Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Archives of Applied Science Research, 2017, 9 (2):30-33
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0975-508X
CODEN (USA) AASRC9

Chemical Composition in Different Species of Ochrophyta along the Coast of Çanakkale, Turkey

Latife Ceyda İRKİN[1]* and Hüseyin ERDUĞAN[2]

[1]Çanakkale Onsekiz Mart University,, Department of Fisheries Technology Çanakkale, Turkey

[2]Çanakkale Onsekiz Mart University, Faculty of Science and Arts, Department of Biology, Biology, Çanakkale, Turkey

ABSTRACT

In recent years there have been numerous research with the aim of generating new resources from different raw materials such as alternative crops. Algae and cellulosic residues. Marine resources has become more important for the last few decades because terrestial and industrial resources cannot supply with the requirement of human population. Also aquatic species have a potential usage to be an alternative renewable crop for the production of several fields from fertilizers to industrial products. The most important member of the aquatic ecosystem is the Algae Marine algae have emerged as an alternative feedstock for the production of numbers of renewable feedstocks. In addition to energy potential, they are the base of chain – photosynthetic organisms including their capability to absorb carbon dioxide higher productivity rates. In the present study seasonal and regional variances of protein, lipid and ash amount of some brown algae (Ochrophyta) along the coast of Çanakkale (Dardanelles) were investigated. The chemical analyses (lipid, ash, protein analyses and the amount of nitrogen free extract) were carried out seasonally. In results significant differences were recorded for the species collected in different seasons and six stations.

Keywords: Ochrophyta, Protein, Lipid, Ash, Çanakkale

INTRODUCTION

The use of aquatic biomass as a renewable energy resource has received much attention over the past decades. Seaweeds as marine bio-mass can be used to avoid competition with food resources [1]. Research has been performed on the use of seaweed in developing new biomass for energy and human consumption [2].

Seaweed can be classified with color and habitat area; green seaweed (Chlorophyta), brown seaweed (Ochrophyta) and red seaweed (Rhodophyta) [3]. Seaweeds growth is higher than terrestrial plants. They also have excellent carbon dioxide fixation capacity. Also they are evaluated to be potentially useful for air purification and as renewable biomass. Recent years algae is increasing with the outcomes of new studies and reports on their nutritional composition and advantages as a food source for human consumption. The industrial utilization of algae continued with the production of organic materials such as alginate, carrageen or carrageenan [4].

Importantance of algae begins as an food source with high level of nutrient components. Also their alternative uses in various fields attracts scientists' interest. At last few decades there is an increase of the utilization of algae in different fields of industry like medicine and cosmetic sector. Today 50% of the total algae (production or harvest) is being used in the food industry, 40% in the medicine sector and 10% is being used in other fields [5]. In the present study. chemical composition in different seasonal distribution of six species from Ochrophyta were investigated along the coasts Çanakkale between September 2007 and June 2008. The results of components changed for different locations and seasons.

MATERIAL AND METHODS

In the present study 6 different species from Ochrophyta were investigated. These are *Padina pavonica* (Linnaeus) Thivy, *Petalonia fascia* (O. F. Müller) Kuntze, *Cladostephus hirsutus* Linnaeus, *Zanardinia prototypus* (Nordo)

Nordo, *Sargassum* vulgare C. Agardh, *Halopteris filicina* (Grateloup) Kützing. Samplings made for four season at different localities along the coast of Çanakkale (40º02' - 40º30' N, 26º10' - 26º45'E) (Figure 1). Species collected from six different locations (Eceabat, Havuzlar, Lapseki, Yapıldak, Çanakkale, İntepe) were separated from epiphytes then washed with tap water and allowed to dry naturally for about 7 days. Samples were dried in a drying oven at 55ºC for constant weight. The dried samples were turned into flour by grinder. These algae powder were used for chemical analyses; protein, lipid, ash contents and the amount of nitrogen free extract (NFE). Lipid analyses were carried out according to Folch et al. [6] protein and ash were analyzed according to AOAC [7] in duplicates. The amount of ash was measured by the formula below.

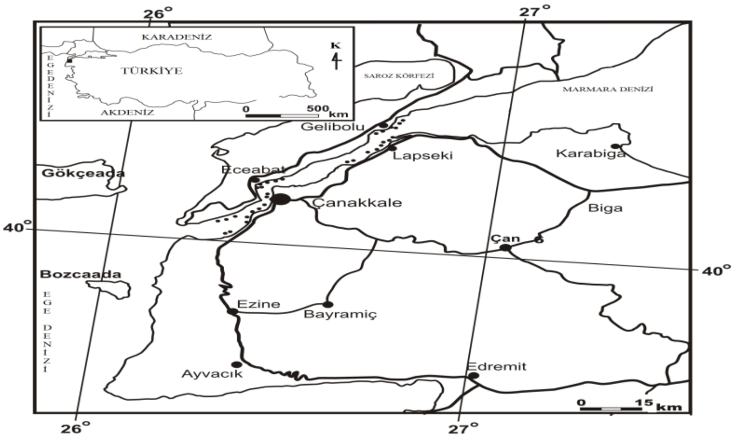

Figure 1: Sampling sites along the coast of Çanakkale.

Crude ash amount (%) = (tr - tf) / m × 100 (tr: recent rhythm, ti: first rhythm, m: sample weight)

Lipid analyses were carried out with the Folch method. The amount of lipid was measured by the formula below.

Crude lipid amount (%) = {(tr-tv) / m} × 100 (m = sample weight, tv = first weight of volumetric flask, tr = recent weight of volumetric flask and the weight of lipid)

Protein analyses were carried out with the Kjeldahl method [7]. The amount of protein was measured by the formula below.

$$\text{Crude protein amount } (\%) = \frac{(tt - tk) \times 14.007 \times 6.25}{m} \times 100$$

(tt: amount used in titration, tk: amount used in titration of blank sample, m: sample weight)

Nitrogen free extracts were calculated with deduction of nutritional fractions from hundred. The amount of NFE was calculated by the formula below.

Nitrogen free extracts (NFE-%)=100–(protein amount+ash amount+lipid amonut)

RESULTS

For this study 6 different species from Ochrophyta were collected from different stations along the coasts of Çanakkale for four seasons. Data for the chemical composition of each sample is different from each other for each location and season (Table 1). The results for *P. pavonica* in autumn in Eceabat are 4.92 ± 0.22% protein, 4.05 ± 0.38% lipid, 60.61 ± 0.84% ash and 30.42 ± 0.22% nitrogen free extract. For the same season in Havuzlar 7.07 ± 0.29% protein, 3.66 ± 0.32% lipid, 72.02 ± 0.18% ash and 17.25 ± 0.34% nitrogen free extract were determined. In autumn in İntepe 4.74 ± 0.54% protein, 1.81 ± 0.44% lipid, 58.29 ± 0.52% ash and 35.16 ± 0.58% nitrogen free extract were recorded. In summer 8.17 ± 0.32% protein, 1.44 ± 0.93% lipid, 27.92 ± 0.70% ash and 62.47 ± 0.38% nitrogen free extract were recognized. *P. fascia* was collected in winter from Ecabat and Lapseki. In Eceabat 13.29 ± 0.66% protein, 4.21 ± 0.42% lipid, 23.29 ± 0.37% ash and 59.21 ± 0.76% nitrogen free extract were determined. For Lapseki 17.56 ± 0.55% protein, 3.03 ± 0.88% lipid, 27.23 ± 0.46% ash and 52.18 ± 0.16% nitrogen free extract were recognized.

Table 1: Seasonal results of species in six different locations of the Çanakkale coasts (%).

SEASONS	AUTUMN				WINTER				SUMMER			
TAXONES	Protein	lipid	ash	NFE	Protein	lipid	ash	NFE	Protein	lipid	ash	NFE
Padina povanica	4.92 ± 0.22	4.05 ± 0.38	60.61 ± 0.84	30.42 ± 0.22								
Petolania fascia					13.29 ± 0.66	4.2 ± 0.42	23.29 ± 0.37	59.21 ± 0.76				
Padina povanica	7.07 ± 0.29	3.66 ± 0.32	72.02 ± 0.18	17.25 ± 0.34								
Petolania fascia					17.56 ± 0.55	3.03± 0.88	27.23 ± 0.46	52.18 ± 0.16				
Cladostephus hirsutus	7.65 ± 0.71	1.39 ± 0.79	41.78 ± 0.99	49.18 ± 0.52								
Zanardinia prototypus					11.19 ± 0.39	6.75± 0.28	36.75 ± 0.83	45.31 ± 0.42				
Sargassum vulgare	8.85 ± 0.88	1.28 ± 0.23	33.97 ± 0.74	55.9 ± 0.16								
Halopteris filicina					5.56 ± 0.89	1.94± 0.36	27.73 ± 0.51	64.77 ± 0.84				
Padina povanica	4.74 ± 0.54	1.81 ± 0.44	58.29 ± 0.52	35.16 ± 0.58					8.17 ± 0.32	1.44 ± 0.93	27.92 ± 0.70	62.47 ± 0.38

C. hirsutus was collected from Yapıldak in Autumn. 7.65 ± 0.71% protein, 1.39 ± 0.79% lipid, 41.78 ± 0.99% ash and 49.18 ± 0.52% nitrogen free extract were determined. *Z. protoypus* was collected in winter from Çanakkale. 11.19 ± 0.39% protein, 6.75 ± 0.28% lipid, 36.75 ± 0.83% ash and 45.31 ± 0.42% were recognized. *S. vulgare* was collected in autumn from İntepe. For this species 8.85 ± 0.88% protein, 1.28 ± 0.23% lipid, 33.97 ± 0.74% ash and 55.9 ± 0.16% nitrogen free extract were determined. *H. filicina* was collected in winter from İntepe. 5.56 ± 0.89% protein, 1.94 ± 0.36% lipid, 27.73 ± 0.51% ash and 64.77 ± 0.84% nitrogen free extract were recognized.

DISCUSSION

In this study six different species from Ochrophyta were investigated for their seasonal chemical composition along the coasts of Çanakkale. The protein levels of species changed for each location and season. % ash and lipid contents of the species are nearly similar to each other. The protein level of the species is between 4.74 ± 0.54% and 17.56 ± 0.55%. The highest protein level (17.56 ± 0.55%) is for *P. fascia* in winter in Lapseki. The minimum protein level (4.74 ± 0.54%) is for *P. pavonica* in autumn in İntepe.

The lipid amount of the species is between 1.28 ± 0.23% and 6.75 ± 0.28%. The highest lipid level (6.75 ± 0.28%) is for *Z. prototypus* in winter in Çanakkale. The minimum lipid level (1.28 ± 0.23%) in autumn is for *S. vulgare* in İntepe. The ash amount of the species is between 72.02 ± 0.18% and 23.29 ± 0.37%. The highest ash level (72.02 ± 0.18%) is for *P. pavonica* in autumn in Havuzlar. The minimum ash level (23.29 ± 0.37%) in winter is for *P. fascia* in Eceabat. The amount of nitrogen free extract (NFE) of the species is between 64.77 ± 0.84% and 17.25 ± 0.34%. The highest NFE level (64.77 ± 0.84%) is for *H. filicina* in winter in İntepe. The minimum NFE level (17.25 ± 0.34%) in autumn is for *P. pavonica* in Havuzlar.

The protein levels of algae are nearly similar to the results determined in the previous studies. The protein amounts of Ochrophyta species are at low stage (7-16 gr/100) in summer. The protein level in summer for Rhodophyta is higher than these (21- 40 gr/100) [8]. Chakraborty and Santra [9] studied about eight benthic algae from Sunderbans and they noticed individual difference between species. The protein content showed a lowest average value of the dry matter in brown algae *Dictyota ceylanica* (3.33%). This result is nearly similar to the result recognized in the present study (4.74 ± 0.54% in *P. pavonica*).

Algae are an essential link of the food chain. They are valuable nutrient sources for human consumption and also as fertilizer for the manure pharmaceutical and cosmetics industry. The usage of algae in medicine sector is in terms of their antifungal antiviral and antibacterial characteristics [10]. The aim of investigation is to determine the seasonal biochemical component levels of some species from Ochrophyta along the coasts of Çanakkale. These results of the present study give most productive information to determine the best time and the location to benefit from seaweeds along the coasts of Çanakkale.

CONCLUSION

Algae are an essential link of the food chain. They are valuable nutrient sources for human consumption. Also as fertilizer for manure, pharmaceutical and cosmetics industry. The usage of algae in medicine sector is in terms of their antifungal antiviral and antibacterial characteristics [10]. The aim of investigation is to determine the seasonal biochemical component levels of some species from Ochrophyta along the coasts of Çanakkale. These results of the present study give most productive information to determine the best time and the location to benefit from seaweeds along the coasts of Çanakkale.

ACKNOWLEDGEMENTS

This project numbered BAP 2008-29 was supported by Çanakkale Onsekiz Mart University Commission of Scientific Research Projects.

REFERENCES

[1] Singh, A., Nigam, P.S., and Murphy, J.D., Mechanism and challenges in commercialisation of algal biofuels. *Bioresource Technol*ogy, **2011.** 102(1): p. 26–34.

[2] Demirbaş, A., *Energy Conversion Management,* **2010.** 51: p. 27–38.

[3] Ross, A.B., et al., *Bioresource Technol*ogy, **2008.** 99: p. 64–69.

[4] Pal, D., Parakash, D., and Amla, D.V., Chemical composition of green seaweeds of Saurashtra Coast. *Botanica Marina,* **1998.** 20: p. 359-362.

[5] Güner, H., and Aysel, V., Tohumsuz Bitkiler Sistematiği Ege Üniversitesi Fen Fakültesi Kitaplar **1999.** p. 108.

[6] Folch, J., Lees, M., and Sloane-Stanley, G.H.S., A simple method for the isolation and purification of total lipids from animal tissues. *J. Biol. Chem*, **1957.** 226: p. 497-509.

[7] AOAC, Official Methods of Analysis *Assoc. Off. Anal. Chem*.17 th Edition Vol II Wash. D.C. USA **2000**.

[8] Ruperez, P., and Saura-Calixto, F., Dietary fibre and physicochemical properties of edible spanish seaweeds *European Food Research Technology*, **2001.** 212: p. 349–354.

[9] Chakraborty, S., and Santra, S. C., Biochemical composition of benthic algae collected from Sunderban. *Indian Journal of Marine Sciences,* **2008.** 37(3): p. 329–332.

[10] Torono, J.G., Diversity of seaweed flora of a Philippines and its utilization. *Hyrobiologia,* **1999.** 399: p. 1–6.