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Research Article

Fatty Acids Composition of Different Marine Macroalgae of South Eastern Cost of India (Gulf of Mannar)

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ABSTRACT

Twenty species of marine macroalgae were collected from the south east cost of India were screened for total lipids, total fatty acids, C16:0, PUFA, EPA, DHA, n3 and n6 by Gas chromatography. The total lipid content varied significantly from 348 mg/100g to 3579 mg/100g and all other fatty acids are also significantly differed among the collected macroalgae species. Brown algae Stoecheospermeum marginatum had higher total lipid, total fatty acids and PUFA were as C16:0, EPA, DHA, n3 and n6 was higher in green algae Halimeda macroloba. Halymenia dilate had the lowest total lipids, fatty acids, C16:0, PUFA, EPA, DHA, n3 and n6.

Key words: *Algae, DHA, EPA and PUFA.*

INTRODUCTION

Marine macroalgae or seaweeds are about 10,000 species[5] and they differ in chemical composition from type, species, season and habitat[9]. They are also considered for higher mineral, vitamins, protein and carbohydrates content. Although macroalgae lipid content was lower, their poly unsaturated fatty acids (PUFA) contents are superior to the terrestrial foods[1]. In recent years, lipid composition in marine macroalgae has raised interest due to their higher content of PUFAs, linolenic acid, octadecatetraenoic, arachidonic and eicosapentaenoic acid (EPA)[2]. This class of Fatty acids was considered as essential nutrient component for human and animals. For example, they play an important role in the prevention of cardiovascular diseases, osteoarthritis, diabetes and antimicrobial, antiviral, anti-inflammatory and antimicrobial properties[2]. The primary objective of the study is to identify the species with high total lipid, fatty acids profiles for the collected marine macroalgae species and application as nutracetuicals in human and animal foods.

MATERIAL AND METHODS

Twenty species of macroalgae were collected by hand picking in March (summer) from South east cost of India (Gulf of Mannar) which includes eight species of red algae (*Acanthophora specifera*,

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Champia compressa, Gracilaria corticata, Gracilaria edulis, Halymenia dilata, Hypnea musciformis, Kappaphycus alvarezii and *Porteria hornemannii*), six species of brown algae (*Dictyota sp., Padina boryano, Padina tetrastomatica, sargassum swartzii, Stoechospermeum marginatum* and *Turbinaria Conoides*) and six species of green algae (*Caulerpa racemosa, Chaetomorpha linum, Halimeda macroloba, Halimeda opuntia, Ulva lactuca* and *Valanopsis pachynema*). Samples were dried at 70°C in hot air oven and later analyzed for fattyacids profile.

Total lipid content was extracted and quantified using Folch method[4]. Fatty acids were extracted by a one step-extraction and quantified as fatty acid methyl esters (FAME) by GC/MS/FID (Schimadzu, Japan). The individual constituents showed by GC were identified and quantified by retention times and peak areas to those of standards (Supelco 37 Component FAME mix). PUFA, EPA, DHA, n3 and n6 were calculated based on the fatty acids.

The data analyzed using general linear model procedure of statistical package for social sciences (SPSS) 15th version and comparison of means was done using Duncan's multiple range test[3] and significance was considered at $P<0.05$.

RESULTS AND DISCUSSIONS

The total lipids, fatty acids, C16:0, PUFA, EPA, DHA, n3 and n6 varied significantly ($p<0.01$) among the species analyzed ranges from 348.0 ± 6.8 to 3579.0 ± 16.8, 213.6± 6.9 to 1181± 7.8, 77.7± 6.0 to 441.0± 6.0, 18.9±1.8 to 514.1±3.3, 0.0±0.0 to 54.7±1.5, 0.0±0.0to 2.1±0.0, 0.1±0.0 to 62.4±4.9 and 1.4±0.1 to 60.7±3.8 mg/100g dry weight. Brown algae *Stoecheospermeum marginatum* showed higher total lipid, fatty acids and PUFA were as C16:0, EPA, DHA, n3 and n6 was higher in green algae *Halimeda macroloba.* Red algae *Halymenia dilate* had shown the lowest total lipids, fatty acids, C16:0, PUFA, EPA, DHA, n3 and n6. The data on lipid content was remained in the range (<4% on DW), as reported earlier for various macroalgal species[6]. The variations in lipid contents were attributed to either species types or environmental factors or a combination of both. Kumari *et al.* was reported that red algae shown marginally lower lipid profile compared to brown and green algae.

Table 1: Fatty acids profile different species of marine macroalgae (mg/100g)

Seaweed species	Total Lipids	Total Fatty acids	C16:0	PUFA	EPA	DHA	n3	n6
Red algae								
Acanthophora specifera	473.0^{c} ±7.9	231.7^{b} ±3.8	134.5^{f} ±6.8	47.2^{cd} ±2.9	5.3^{e} ±0.7	0.1^{d} ±0.0	6.3^{c} ±0.7	17.0^{f} ±1.7
Champia compressa	420.0^{b} ±6.4	237.4^{b} ±4.9	102.5^{c} ±5.9	64.5^{e} ±3.7	16.2^{g} ±1.7	0.1^{e} ±0.0	17.6^{ef} ±0.3	28.9^{g} ±2.9
Gracilaria corticata	560.0^{e} ±5.7	324.7^{e} ±7.3	224.6^{j} ±5.3	52.4^{d} ±3.6	5.8^{e} ±0.8	0.0^{a} ±0.0	6.2^{c} ±0.7	14.1^{e} ±1.6
Gracilaria edulis	579.0^{e} ±6.9	496.0^{i} ±5.9	179.5^{i} ±9.4	41.2^{c} ±4.9	0.7^{ab} ±0.0	0.0^{a} ±0.0	16.5^{e} ±0.8	3.8^{a} ±0.7
Halymenia dilate	348.0^{a} ±6.8	219.1^{a} ±2.9	77.7^{a} ±6.0	18.9^{a} ±1.8	0.0^{a} ±0.0	0.0^{a} ±0.0	0.1^{a} ±0.0	1.4^{a} ±0.1
Hypnea musciformis	520.0^{d} ±4.6	285.8^{c} ±3.7	150.9^{g} ±8.4	33.7^{bc} ±2.0	1.8^{bc} ±0.0	0.2^{f} ±0.0	4.7^{bc} ±0.1	6.3^{b} ±1.0
Kappaphycus alvarezii	868.0^{h} ±7.4	531.4^{j} ±2.9	370.2^{m} ±2.1	35.5^{bc} ±7.8	2.9^{cd} ±0.0	0.0^{a} ±0.0	5.59^{bc} ±0.1	10.7^{c} ±1.8
Porteria hornemannii	628.0^{f} ±9.6	307.3^{d} ±9.3	111.0^{d} ±2.9	61.9^{e} ±4.0	0.3^{ab} ±0.0	0.0^{a} ±0.0	4.00^{ab} ±0.2	3.3^{a} ±0.3
Brown algae								
Dictyota sp.	1710.0^{l} ±8.9	906.2^{m} ±9.3	363.6^{m} ±8.0	376.7^{l} ±6.4	11.3^{f} ±0.1	0.0^{a} ±0.0	11.6^{d} ±1.1	106.7^{l} ±6.8
Padina boryano	810.0^{h} ±9.6	421.0^{g} ±7.3	246.1^{k} ±3.9	106.0^{f} ±2.5	1.7^{bc} ±0.0	0.0^{bc} ±0.0	3.6^{ab} ±0.34	17.5^{f} ±1.4
Padina tetrastomatica	862.0^{h} ±1.9	454.7^{h} ±8.2	104.9^{c} ±2.3	146.7^{h} ±2.1	3.53^{d} ±0.6	0.0^{a} ±0.0	1.9^{ab} ±0.87	29.34^{g} ±1.0
Sargassum swartzii	767.0^{g} ±7.0	434.2^{h} ±2.9	119.0^{e} ±2.9	174.6^{i} ±3.6	1.2^{ab} ±0.0	0.0^{ab} ±0.0	1.8^{ab} ±0.0	27.4^{g} ±3.0
Stoecheospermeum marginatum	3579^{m} ±16.8	1181^{n} ±7.8	293.1^{l} ±3.9	514.1^{m} ±3.3	1.6^{bc} ±0.0	0.5^{h} ±0.0	31.0^{h} ±1.9	67.9^{k} ±5.9
Turbinaria Conoides	807.0^{h} ±11.9	552.5^{j} ±5.9	172.5^{h} ±7.0	194.4^{j} ±4.6	2.1^{cd} ±0.0	0.7^{j} ±0.0	20.4^{f} ±1.0	45.5^{i} ±4.8
Green algae								
Caulerpa racemosa	1690.0^{k} ±8.9	607.9^{k} ±4.8	297.0^{l} ±8.6	129.2^{g} ±2.8	16.3^{g} ±0.2	0.0^{cd} ±0.0	24.0^{g} ±2.6	34.8^{h} ±3.2
Chaetomorpha linum	1468.0^{i} ±9.1	834.7^{l} ±7.8	244.0^{k} ±7.0	250.8^{k} ±3.8	5.0^{e} ±0.0	0.3^{g} ±0.0	12.5^{d} ±1.9	105.2^{l} ±7.9
Halimeda macroloba	1660.0^{j} ±8.7	730.2^{k} ±6.7	441.0^{n} ±6.0	149.5^{h} ±4.8	54.7^{h} ±1.5	2.1^{k} ±0.0	62.4^{i} ±4.9	60.7^{j} ±3.8
Halimeda opuntia	419.0^{b} ±7.3	213.6^{a} ±6.9	144.5^{g} ±5.0	27.8^{b} ±2.7	5.4^{e} ±0.0	0.0^{a} ±0.0	5.7^{bc} ±1.5	10.3^{c} ±1.9
Ulva lactuca	524.5^{d} ±5.8	357.8^{f} ±8.0	89.0^{b} ±1.9	40.7^{c} ±1.9	0.5^{ab} ±0.0	0.6^{i} ±0.0	1.9^{ab} ±0.32	12.9^{de} ±2.1
Valaniopsis pachynema	1615.0^{j} ±6.4	613.5^{k} ±7.2	345.4^{m} ±3.5	163.2^{i} ±4.3	2.4^{cd} ±0.1	0.0^{a} ±0.0	3.6^{ab} ±0.2	27.6^{g} ±1.9
Means bearing different superscripts in the same column differ significantly ($p<0.01$)								

CONCLUSIONS

The brown macroalgae *Stoecheospermeum marginatum ha*s higher total lipids, total fatty acids and PUFA. Green algae *Halimeda macroloba* has C16:0, EPA, DHA, n3 and n6. *Halymenia dilate* had the lowest total lipids, fatty acids, C16:0, PUFA, EPA, DHA, n3 and n6.

REFERENCES

1. Darcy-Vrillon, B., Nutritional aspects of the developing use of marine macroalgae for the human food industry. *International Journal of Food Sciences and Nutrition (United Kingdom)* (1993).
2. Dawczynski, C., Schubert, R. and Jahreis, G., Amino acids, fatty acids, and dietary fibre in edible seaweed products. *Food Chemistry*, **103(3):** pp. 891-899 (2007).
3. Duncan, D. B., Multiple range and multiple F tests. *Biometrics* **111(1):** 1-42 (1955).
4. Folch, J., Lees, M. and Sloane Stanley, G. H., A simple method for the isolation and purification of total lipides from animal tissues. *J biol Chem*, **226(1):** pp. 497-509 (1957).
5. Guiry, M. D., Guiry, G. M., Morrison, L., Rindi, F., Miranda, S. V., Mathieson, A. C., Parker, B. C., Langangen, A., John, D. M., Bárbara, I., Carter, C. F., *AlgaeBase: an on-line resource for algae. Cryptogamie, Algologie* **35(2):** 105-15 (2014).
6. Herbreteau, F., Coiffard, L. J. M., Derrien, A. and De Roeck-Holtzhauer, Y., The fatty acid composition of five species of macroalgae. *Botanica Marina*, **40(1-6):** pp. 25-28 (1997).
7. Kumar, C. S., Ganesan, P., Suresh, P. V. and Bhaskar, N., Seaweeds as a source of nutritionally beneficial compounds-a review. *Journal of Food Science and Technology*, **45(1):** p. 1 (2008).
8. Kumari, P., Bijo, A. J., Mantri, V. A., Reddy, C. R. K. and Jha, B., Fatty acid profiling of tropical marine macroalgae: an analysis from chemotaxonomic and nutritional perspectives. *Phytochemistry*, **86:** pp. 44-56 (2013).
9. Makkar, H. P., Tran, G., Heuzé, V., Giger-Reverdin, S., Lessire, M., Lebas, F., Ankers, P., Seaweeds or livestock diets: a review. *Animal Feed Science and Technology* **212(1):** 1-7 (2016).