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Comparative Fatty Acids Composition of Five Species of Codium (Cholorophyta) Found at Coast of Karachi Pakistan

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Absrct: The saturated and unsaturated fatty acids are present as the (Methyl esters) in-hexane: $CHCl_3$ extract of five species. These species are *Codium elongatum; Codium coronatum selch, Codium laevigatum Nizamuddin , Codium decorticatum, and Codium flabellatum,* related with the Chlorophyceace were collected from Karachi Coast for the analysis of fatty acids. The relative % percent ages of different acids which are present in and these species.The saturated and unsaturated fatty acids are 51 detected from the five species .Saturated fatty acids are 17 and unsaturated fatty are 37.In which the mononic acids are 12 dioninic acids are 05, trienoic acids are 11and polyenoic acids are 01.

Keywords : $CHCl_3$ extract of five species, *Codium coronatum selch*

1. INTRODUCATION

Nutritional value of seaweeds for Marine fauna can be assessed by chemical analysis of Marine algae. *(Huoking and Hartnoll* 1983*).* Chemical analysis of Marine algae is a valuable source of lipid, protein and carbohydrates on commercial scale.*(Chapman and Chapman* 1980*).* Chemical analysis of Marine algae imply as the cheapest dietary source for human beings. Seaweeds like *Ulva pertusa,* Prophyra tenera have been analyzed with high nutritional value Generally an algal composition is (typically) 25.30% fats, 10-20% proteins and 2.4% vitamin and 0.2-0.5% minerals collected on the bases of total dry weight).

Fatty acids belong to the category of organic compounds. They are the essential part of the human diet so their metabolism is under research since quite long. Polyunsaturated fatty acids and omega – 3 fatty acids plays an important role in prevention of hypertension, diabetes mellitus type – II, renal diseases, rheumatoid arthritis, ulcerative colitis, chronic pulmonary obstructive disease the seaweeds are important source of long chain poly unsaturated essential fatty acids from N-3 family (N-3 LC – PUPA) Such as eicosa pantaenoic acid (EPA-20, 5N-3). The Eloisa pentanoic acid can help in the reduction of risk factors of some diseases and thrombosis. In Japan seaweeds are considered a part of their routine diet. According to recent information's, seaweeds are the major source of income for fishermen. They earn 5% income from green alga, 66.5% from brown algae, and 28% from red algae. In Japan, China, Korea 33% seaweeds are used on daily basis, as salads and are very famous due to presence protein, carbohydrates, minerals, fatty acids and vitamins. (Abbot 1988*).* Seasonal variations on the chemical composition of Marine algae have also been reported from Hongkong. Coastal India and Ireland but little changes have been repeted in the composition of macro-Marine algae of tropical regions of Australia. Due to greater amount of protein in Marine algae *(Qan & Parekh* 1975*),* they can be used to supplement the human diet. The carbohydrate of seaweeds are different from higher land plants and have more vitamins like A, B_1, B_2, B_6, B_{12} and Niacin. *(Anggidredja* 1993*).* Riboflavin, B_{12} and Niacin can be added in human diet by using Marine algae (Aaronson 1986).

The 10.6% protein, 31.76% carbohydrate and 11.5% lipid have been reported in Gracialaria cortica collected from Paradise Point of Karachi *(Qari and* 1993*).*

2. METHOD AND MATERIAL

Isolation of Fatty Acids.

Seaweed Material.

Seaweeds were collected from Karachi coast and collected materials were washed with water and dried under shade at room temperature for 20 days.

Extraction.

The dried how much were chopped into small pieces and were dipped in two liter ethanol (EtOH) for about one month at room temperature .The ethanolic extract was filtered and evaporated under, reduced pressure below 40°C using Rotary Evaporator, which yielded dark green gummy residue

Saponification.

Quantity of 150 ml. Ethanol (EtOH) and water (H_2O) (1:1,V/V) containing 10% KOH was added to the

residue and reaction mixture was refluxing at 100 °C for 6 h. The mixture was concentrated under reduced pressure at rotary evaporator, and thereafter (H_2O) and diethyl ether (Et_2O) were added, and this procedure was repeated three times. The unsaponifiable matter was partitioned and their by separated .The aqueous alkaline fraction was acidified with 6NOHCl (PH 5-6) and then extracted several times with (Et_2O).The total Et_2O fraction was dried over anhydrous Na_2SO_4 and on evaporation of Et_2O residue was obtained.

Column Chromatography (CC).

The residue containing fatty acids fraction was Chromatographaed over silica gel.(70-230mesh Merck) column. The column was first eluted with n-hexane and there after Diethyl ether was added in order of increasing polarity. First Fraction was eluted with pure hexane, fraction "A" was eluted from hexane: Chloroform (85:15), fraction "B" from hexane: Diethyl ether (80:20), fraction "C" from hexane: Diethyl ether (75:25), and fraction "D" from hexane: Diethyl ether (70:30)

Esterifaction

All fractions (A-D) were estrified with diazomethane, 0.5 mg of each fraction was dissolved in MeOH and 0.5 ml of diazomethane was added. The reaction mixture was kept overnight at room temperature (28°C) and was then evaporated .The methylated fatty acid fractions were analyzed first by GC and finally by GC-MS.

Identification.

Gas Chromatrography-Mass spectrometry (GC-MS)

The fatty acids (methyl ester) fractions were finally analyzed and identified by GC-MS, The analysis was performed on JEOL JMS 600H Agilest 6890N, equipped with 30 m×0.32 ZP-5MS column, stationary phase coating 0.25µm. The column temperature was kept at 70˚C for 2 min with an increase at the rate of 4˚C per min up to 260˚C. Injection temperature 250˚C, split ratio 1:45, the carrier gas (Nitrogen/Helium) flow rate 1.0 ml/min.

3. RESULTS AND DISCUTIONS

The saturated and unsaturated fatty acids are present as the (Methyl esters) n-hexane: $CHCl_3$ extract of five species. These species are *Codium elongatum; Codium coronatum selch, Codium laevigatum Nizamuddin Codium decorticatum, and Codium flabellatum,* related with the Chlorophyceace and were collected from Karachi Coast for the analysis of fatty acids. The relative % percent ages of different acids which are present in these species is summarized in Table-1 The saturated and unsaturated fatty acids are detected 51 from the five species . Saturated fatty acids are 17 and unsaturated fatty are 37. In which the mononic acids are 12 dioninic acids are 05, trienoic acids are 11 and, and polyenoic acids **(Table1)** The greater diversity is present in unsaturated fatty acids (UFA) than (SFA) saturated fatty acids in the concerned plant material of research .The unsaturated fatty acids are present in very large quantity. *Codium flabellatu*, (84.67%) *Codium decorticatum* (84.56%). Codium elongatum (83.5%). *Codium coronatum selch*.(64.00%) *Codium laevigatum Nizamuddin* (61.47%). **(Table-1, 2,** 3, 4, 5,) The quantity of (SFAs) was *Borgesan* (41.68%). *Codium coronatum* selch (35.99%). *Codium laevigatum Nizamuddin (*38.52*%). Codium decorticatum* (15.43%) Codium elongatum (15.43%). *Codium flabellatu* (15.32%). (Table 1, 2, 3, 4, 5,) The range of USFs as (58.31-84-67%) and the range of SFAs as (15.32-41.68).The fatty acids 9-Decenoate C_{10}:1 were present in only *Codium coronatum selch* (0.89%) Methyl - decatrienoate C_{11}:3 in *Codium coronatum selch* (0.18%) Octadecatrienoate C_{18}:3 in *Codium decorticatum* (7.29%) Propionate C_{10}:1(7.29%) Tridecadienoic acid *Codium coronatum selch* (1.8%) C_{21}:0 Archidate Codium laevigatum Nizamuddin (36.12%) n-nonadecylate $C_{20:}$(11.05%) Methyl-n-dotriacontanoate C30:0 (61.2%) *Codium decorticatum* Behenate C_{22}:0 Codium laevigatum Nizamuddin (0.67%) Pentacosanoate C_{26}: (4.03%) *Codium decorticatum* (0.18%) Detricasonic C_{13}:0 *Codium decorticatum* (6.21%) these fatty acids are present in only one over all (Table 1).

Tridecylate (C_{14}:0) was present in five species with the exception of *Codium flabellatum* in the range of (4.08 –9.33%) (Table7) and Myristate (C_{15}:0) present in five species with the exception of *Codium flabellatum* in the range of (6.85 –1.1%2)(Table7).

The Palmilate acids (C_{16}:0) is saturated and most widespread fatty acids present in all five species. which are *Codium elongatum, Codium coronatum selch Codium laevigatum Nizamuddin , Codium decorticatum and Codium flabellatum,* in the range of (4.08 – 9.33%)(Table7) and Heptadectrienote C_{17}:3, is trienoic and present in all five species in the range of (32.51 - 2.43%) Stearate C_{19}:0, is a saturated and was found in four species with the exception of two species Codium elongatum, and Codium laevigatum Nizamuddin the range between four species was (1.89–4.78%) (Table-1). fatty acids (C_{19}:1%) is mononic present in 5 species *Codium elongatum* (11.00%) *Codium flabellatum (*10.81) *Codium laevigatum Nizamuddin* (4.29%) *Codium coronatum* selch.(3.36%) *Codium decorticatum* (3.2%1), n-Heptacosanoate (C_{28}:0%) are found in four species with the exception of *Codium laevigatum Nizamuddin* and Codium decorticatum the quantity range of fatty acids were (0.63 -12.77%) 9-12

Heptadecadienoate C_{18}:2, present in three species *Codium iyengaria* (10.30%) *Codium coronatum* selch (4.37%), and *Codium flabellatum* (1.14%) n-Heptacosanoate C_{20}: o fatty acids is present in three species *Codium decorticatum* (44.77%) *Codium flabellatum* (45.12%) *Codium iyengaria* (45.52%) Pantadecylate C_{15}:0 *Codium flabellatum* (45.12%) *Codium iyengaria* (2.03%) Margorate C_{18}: (5.68) *Codium coronatum selch* (0.73%)

4. CONCLUSIION

Over all conclusion result showed that some fatty acids are present in large amount and were present in all five species and some fatty acids were present in very low quantity and some were rear and very minute quantity Heptadectrienote $C_{17:3}$ present in all five species) *Codium decorticatum* and *Codium laevigatum Nizamuddin* . In the range of (2.43-32.51 %) (Table 1) Tridecylat (C_{14}:0) present in five species with the exception of *Codium flabellatum* in the range of (4.08 –9.33%) (Table) and Myristate (C_{15}:0) was present in five species with the exception of *Codium flabellatum* in the range of (6.85 –1.1%2) **(Table-1).**

The Palmilate acids (C_{16}:0) is saturated and most widespread fatty acids present in all six species. Which are *Codium elongatum, Codium coronatum selch Codium laevigatum Nizamuddin , Codium decorticatum and Codium flabellatum,* in the range of (4.08 – 9.33%) (Table7) and Heptadectrienote C_{17}:3, is trienoic and was present in all six species in the range of (32.51 -2.43%) (Table1)

Investigated 36 fatty acids from five Siphonaceous spices of green algae *Caulerpa chemnitzia, Caulerpa faridii Nizam., Caulerpa manorensis, Caulerpa racemosa, Caulerpa taxifolia these algae were c*ollected from the Karachi coast in this study 18 saturate fatty acids and 3 unsaturated fatty acids were detected in which the unsaturated fatty acids are found in high quantity than the saturated fatty acids however the palmitic and stearic acids were found in all five species. (Aliya *et al* 1993)

The fatty acids isolated from two species of green algae *Bryopsis pennata lamour* and *Volopniopsis pachynema* collected from Karachi coast and fatty acids identified as methyl esters, in which 9 saturated and 25 unsaturated fatty acids Same fatty acids were present in both green algae**.** *(Aliya et al* 1995): Investigated the twelve *siphonceous green seaweeds Bryopsis pennata Lamour, Volopniopsis pachynema, Caulerpa chemnitiza, Caulerpa faridii Nuzam., Caulerpa manorensis Caulerpa racemosa , Caulerpa taxifolia Codium decorticatium L.monstrosum (Mont.) Nizam. Codium flebellatum Sive et Nizan. Codium iyengarii Borg,Cladophora uncinella (vahl) C.Ag.,Chaetomorpha antennina* Collected from Karachi coast. Detected 18 saturated and 24 unsaturated fatty acids and 16 monoenoic acids from these species. Unsaturated fatty acids were detected in high proportion (63.12%) and saturated fatty acids were less a unsaturated fatty acids. (.Aliya *et al* 1995)

Table. 1 Saturated Fatty acids

C_{13}	Tridecadienoic acid	210	-	-	-	1.8	-
C_{15}	Methyl tricosenoate	236	0.44	-	-	-	-
C_{16}	Hexadecane-1,diol	258	-	-	-	-	-
C_{17}	n-Heptaecenoic acid	208	-	-	-	0.18	19.9
C_{20}	Eicosa-8,11,14-trienoic acid	306	7.58	3.09	-	-	-
C_{20}	n-Heptacosanoate	424	4. 37	-	-	-	-
C_{20}	n-Nonadecanoate	312	-	-	-	-	11.05
C_{20}	n-Heptacosanoate	424	-	-	-	12.77	+(0.63)
C_{30}	Methyl-n-dotriacontanoate	492	-	-	-	3.72	-

MONOENOIC:	Name of fatty acids	Mol.wt	C. *decorticatm*	C. elongatum	C. lalum	C, coronatum	C, flabellatum
C_{10}:1	9-Decenoate	184	-	-	-	0.89	-
C_{16}:1	9-Hexadecenoate	268	2.04	-	-	-	-
C_{17}:1	Heptadecenoate	282	-	3.36	13.77		7.14
C_{18}:1	9-Octadecenoate	296	3.21	11.00	4.29	3.37	10.81
C_{19}:1	Nenodecenoic acid	310	1.46	-	-	-	-
C_{20}:1	9-Eicosenoate	324	-	-	-	1.59	-
C_{21}:1	Heneicosenote	338	-	-	-	-	-
C_{22}:1	11-Docoenoate	352	-	-	-	2.3	3.46
C_{23}:1	Methyl-tricosenote	366	-	2.28	-	-	15.01
C_{24}:1	Eicosa-8,11,14-trienoic acid	380	2.68				3.46
C_{25}:1	n-Hexacoseoic acid	394	1.46	-	-	25.71	2.41
C_{29}:1	Nonacosenoate	450	1.90	-	-	2.13	+(1.99)
DIENOIC:							
C_9:2	3,8-Dimethyl-27-nonadicneate	196	-	-	-	0.18	0.52
C_{15}:2	11▲2,3cyelopenty	252	-	-	-	-	-
C17:2	Heptadecadienoate	280	4.37	-	-	1.14	1.14
C_{18}:2	Octadecadienoate	294	1.6				3.36
$C_{20:6}$	Eicosadienoate	322				0.88	
TRIENOIC:							
C_{10}:3	Methyel decatrienoate	180	-	-	-	0.34	
C_{12}:3	Tridecatrienoate	250	-	-	-	3.37	0.85
C_{13}:3	Tridecatrienoate	222	-	-	-	0.88	0.53
C21:3	Eicosatrienoate	320		3.20			1.36
C_{17}:3	Heptadectrienote	278	16.03	2.95	32.51	9.4	2.62
C_{18}:3	9,12,15,Octadecatrienoate	292	7.29	-	-	-	-
C_{21}:(n-3)	Methyl(allcis)-eico-sapentaenoate	316	-	-	-	-	2.13
$C_{28:3}$	Nonacosatrienoicacid	432	4.37				+(4.09)
C_{29}:3	n-Tricontanoate	466	-	-	-	0.89	-
C3o:3	Detricasonic	480	-	-	-	6.21	-
POLYENOIC							
C9:4	Nonatetraenoate	164	-	-	-	3.55	-

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