Original Research Article

PHYTOCHEMICAL ANALYSIS OF ALGAL SPECIES ~~SHOWS~~ FOUND IN SUTRAPADA COASTAL REGION OF GUJARAT

Abstract:

The aim of the present paper is to assess the phytochemicals of nine marine algae species which is further divided in three classes. The qualitative phytochemical analysis were done on nine different algae species of Saurashtra coastal belt in Gujarat. For the qualitative phytochemical analysis total 16 different parameters were analyzed on algae species. Extract prepared in two solvents viz., chloroform extract (CE) and acetone-water extract (AWE). Amongst the two different extracts, acetone water extract showed the presence of maximum number of phytochemical compounds. Next to that, acetone, water extract showed steroid, glycosides, tannin, protein and flavonoids compounds were present in all algae species. The ~~estimation~~ presence of tannins, steroid, glycosides, reducing sugar, protein and flavonoids were observed in two extracts of three algal classes.

Key Words: seaweed, phytochemical, -qualitative, extracts, coast, Sutrapada.

Introduction:

Marine algae comprises more than 60 trace elements in a concentration much higher than in terrestrial plants. They also contain protein, iodine, bromine, vitamins and substances of stimulatory as well as antibiotic in nature. Marine macro algae are the renewable living resources which are also used as food, feed, and fertilizer in many parts of the world

(Chapman, 1998). Seaweeds have been reported to contain secondary metabolites which contain alkaloids, glycosides, flavonoids, saponins, tannins, steroids, and related active metabolites, and have been far used in the drug and pharmaceutical industry (Eluvakkal et al., 2010). In *Ulva Lactuca*, Qualitative phytochemical screening of the powdered green algae reveals the presence of alkaloids, flavonoids, saponins, terpenoids and cardiac glycosides is detected (Dalia F. Abd et al-2014). Seaweeds are used as alternative source for anti-bacterial, anti-inflammatory, anti-oxidant and anti-cancer in the near future (Y. Melpha et al-2014). The presence of various phytochemicals compounds identified through this study, rationalise the use of marine algae for various ailments in traditional therapy (Sivakumar Dhevika et al-2018). The presence of reducing agents in synthesizing nanoparticle can be potent antimicrobials in near future. The biosynthesized nanoparticles showed evidence of high anti-bacterial activity against all test pathogens compared to phytochemical constituents (P Kumar et al-2012). Phenolic compounds are widely distributed in the plant kingdom and have been reported to have several biological activities including antioxidant properties. The phenolic compounds may affect the growth and metabolism of bacteria. They could have an activating or inhibiting effect on microbial growth according to their constitution and concentration (Vimala, M. Reginald et al-2015). The major algal classes observed on coast of Sutrapada region were likely to be *Chlorophyta*, *Rhodophyta* and *Phaeophyta.* The seaweed recorded ~~on~~ in – Sutrapada coastal – region have many medicinal and economic uses especially in manufactorinŋes products – for the food and it is a primary source for many industries. It is reported in literatures that seaweeds have extensive medicinal properties specifically in cardiac~~l~~ disorders, blood purification and many other uses as these seaweed also possess anti-microbial properties. The role of phytochemicals is important in seaweeds as secondary metabolite because these secondary metabolites provide them the medicinal properties. Hence, these species of seaweed were analyzed for secondary metabolites like proteins,

~~proteins~~, terpenoids, flavonoids, ~~tannis~~tannins, phytostetol, amino acid, etc. There were nine seaweeds species collected from sutrapada coastal area having many medicinal properties in different diseases. In the present study, we investigated phytochemical qualitatively from various extracts of seaweeds. Selected nine marine macro algae were divided in three major classes which commonly occurs on Gujarat coast.

There were three species of Chlorophyta class, (*Caulerpa racemosa, Chactomorpha crassa Iand Ulva lactuca*). Three species in class Phaeophyta (*Padina tetrastromatica, Giffordia mitchellae* and *Sargassum tenerrimum*) and Rhodophyta (*Scinaia carnosa, Halymenia venusta* and *Champia indica*) each found on coastal belt of Sutrapada. The prime importance of this study is to ~~be~~ highlighte~~d is~~ the phytochemical study on six species of seaweeds such as *Scinaia carnosa, Chactomorpha crassa, Giffordia mitchellae, Caulerpa veravalensis, Champia indica* and *Halymenia venusta* are not reported ~~s~~till date.

Methodology:

(i) Study Area:

Collection site is 5 km coastal belt of sutrapada which is situated in Gir Somnath district, Gujarat. (GPS location : 20.8437^0 N 70.4759^0 E)

(A) Gujarat **(B) Sutrapada**

Fig 1: Map showing study area

(ii) Sample Preparation:

Seaweeds were collected for conducting qualitative phytochemical analysis of nine algal species namely *Caulerpa racemosa, Scinaia carnosa, Padina tetrastromatica, Chactomorpha crasa, Giffordia mitchellae, Caulerpa veravalensis, Ulva lactuca, Halymenia venusta, Champia indica* and *Sargassum tenerrimum* from coastal belt of Sutrapada of Saurashtra coast. Seaweed were crushed by mortar pestle grinded to powder. The powders were used for preparing extract in chloroform and acetone:water (1:1). ~~10 gm. Powder of seaweeds were subjected to 50 ml of solvent for 24 hrs. after which it was filtered using whattman filter paper no 1.~~ We soaked 10 gm of seaweed powder in 50 ml of solvent for 24 hrs and then filtered it using Whattman filter paper-no 1. The sample prepared were analyzed for different phytochemical qualitative analysis of various parameters like steroids (Nidal Jaradat et al-2015), tannin (Mercy Gospel Ajuru et al-2017), Coumarin (Mercy Gospel Ajuru et al-2017), Phytostetol (Ashok Kumar et al-2012), Phenolic compounds (Mercy Gospel

Ajuru et al-2017), Flavonoids (Abdul Wadood et al-2013), carbohydrates (Nidal Jaradat et al-2015),Proteins (Nidal Jaradat et al-2015), Phiobatannis (Abdul Wadood et al-2013), Reducing sugar(Ashok Kumar et al-2012), Amino acids (Nidal Jaradat et al-2015), Glycosides(Ashok Kumar et al-2012) and Terpenoids (Nidal Jaradat et al-2015).

Results:

Table; 1 Phytochemical analysis of *Chlorophyta* class:

Sr. No.	**Phytochemical test**	***Caulerpa racemosa* (A)**		***Chactomorpha crassa* (B)**		***Ulva lactuca* (C)**	
		CE	**AWE**	**CE**	**AWE**	**CE**	**AWE**
1.	Steroid	-	+	-	-	?	+
2.	Phytostetol (Salkowski's test)	-	-	-	-	-	-
3.	Tannin	-	+	-	+	+	+
4.	Coumerins	-	-	-	-	-	-
5.	Phiobatannis	-	-	-	-	-	-
6.	Alkaline(Flavonoids)	-	-	-	-	+	+
7.	NH4OH (Flavonoids)	-	-	-	-	-	+
8.	Zn-Test (Flavonoids)	-	+	-	-	-	+
9.	Carbohydrate(Fehling'S)	+	-	+	-	+	-
10.	Reducing	+	-	+	-	+	+

	sugar(Benedict's)						
11.	Amino acids (Ninhydrin test)	-	+	-	-	+	+
12.	Protein (Million tests)	+	-	-	+	-	-
13.	Glycosides (Keller-Kiliani Test)	+	+	+	+	+	-
14.	Terpenoids (Salkowski test)	+	-	+	-	-	+
15.	Phenols compounds (Ferric chloride test)	+	-	-	-	+	+
16.	Carbohydrates (Molisch test)	-	-	-	-	+	-

***(CE; chloroform extract, AWE; acetone:water extract)**

Here, total ten phytochemicals such as steroid, tannin, flavonoids, carbohydrate, reducing sugar, amino acids, protein, glycosides, terpenoids and phenols compounds ~~total ten phytochemical~~ were present in this class, while~~. Where~~ coumerins, phytostetol and phiobatannis ~~is~~were not present in this class.

Chart: 1 *Chlorophyta* seaweed phytochemicals

Comment [A1]: Chart 1 shows steroid is present in A and B, however according to Table 1 steroid tests are positive for seaweed A and C. There is also mismatch between Table 1 data and Chart 1 data for protein and carbohydrate test. Please correct such errors, if there is any in entire paper. Additionally, please report steroid test result of chloroform extract of seaweed C in Table 1.

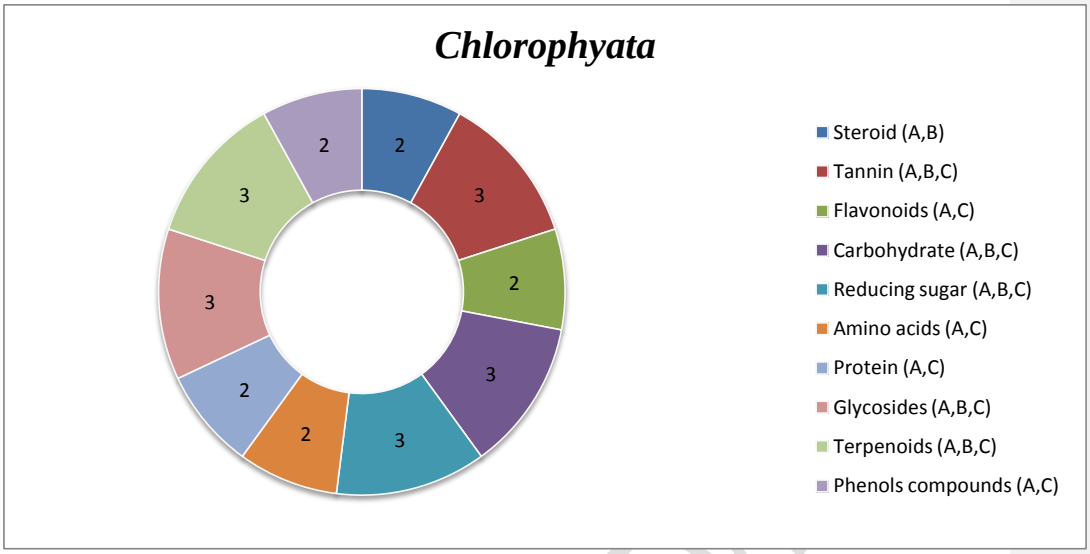


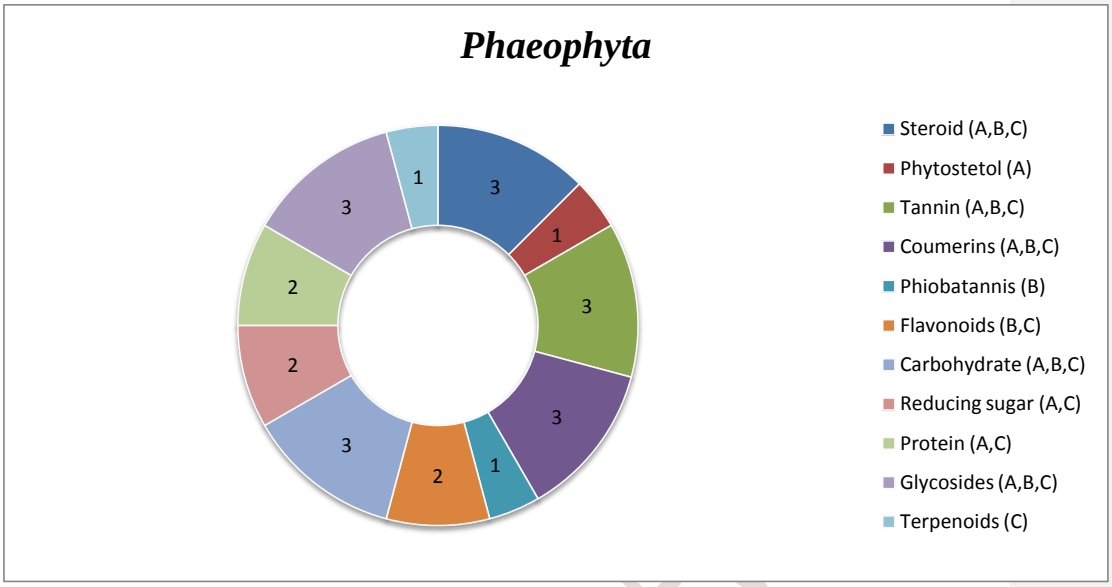
Table: 2 Phytochemical analysis of *phaeophyta* class

Sr. No.	Phytochemical test	*Padina tetrastromatica* (A)		*Giffordia mitchellae* (B)		*Sargassum tenerrimum* (C)	
		CE	AWE	CE	AWE	CE	AWE
1.	Steroid	-	+	-	+	-	+
2.	Phytostetol (Salkowski's test)	+	-	-	-	-	-
3.	Tannin	+	+	+	-	+	+
4.	Coumerins	-	+	+	-	+	+
5.	Phiobatannis	-	-	+	-	-	-
6.	Alkaline(Flavonoids)	-	-	+	-	+	+
7.	NH4OH (Flavonoids)	-	-	-	+	-	-

8.	Zn-Test (Flavonoids)	-	-	-	-	-	-
9.	Carbohydrate(Fehling'S)	+	-	+	-	-	-
10.	Reducing sugar(Benedict's)	-	+	-	-	+	+
11.	Amino acids (Ninhydrin test)	-	-	-	-	-	-
12.	Protein (Million tests)	-	+	-	-	+	+
13.	Glycosides (Keller-Kiliani Test)	+	+	+	+	+	+
14.	Terpenoids (Salkowski test)	-	-	-	-	+	+
15.	Phenols compounds (Ferric chloride test)	-	-	-	-	-	-
16.	Carbohydrates (Molisch test)	-	-	-	-	+	+

***(CE; chloroform extract, AWE; acetone:water extract)**

Chart: 2 *Phaeophyta* seaweed phytochemicals



Total 11 phytochemical present in three different species of phaeophyta class. Which is steroid phytostetol tannin coumerins phiobatannis flavonoids Carbohydrate Reducing sugar Protein glycosides terpenoids. Here phenols compounds and Amino acids were absent with respective testes.

Table:3 Phytochemical analysis of *Rhodophyta* class

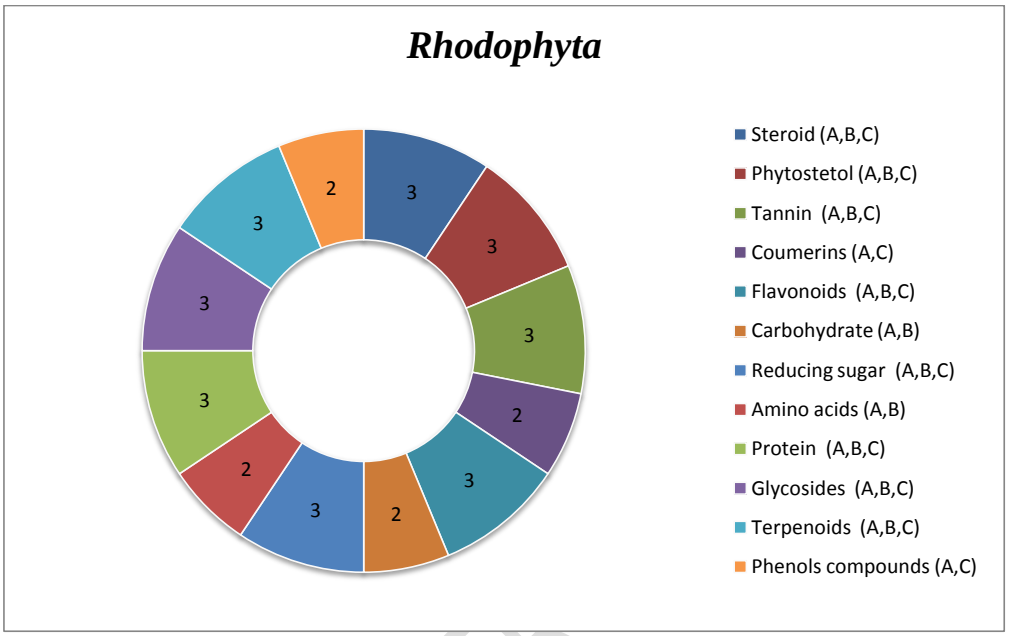
Sr. No.	**Phytochemical test**	***Scinaia carnosa* (A)**		***Halymenia venusta* (B)**		***Champia indica* (C)**	
		CE	**AWE**	**CE**	**AWE**	**CE**	**AWE**
1.	Steroid	-	+	+	+	+	+
2.	Phytostetol (Salkowski's test)	-	+	+	-	+	+
3.	Tannin	+	-	-	+	+	+

4.	Coumerins	+	+	-	-	+	-
5.	Phiobatannis	-	-	-	-	-	-
6.	Alkaline(Flavonoids)	+	+	-	+	+	-
7.	NH4OH (Flavonoids)	+	+	-	-	-	+
8.	Zn-Test (Flavonoids)	-	-	-	-	-	-
9.	Carbohydrate(Fehling'S)	-	-	+	+	-	-
10.	Reducing sugar(Benedict's)	-	+	+	+	+	-
11.	Amino acids (Ninhydrin test)	-	+	-	+	-	-
12.	Protein (Million tests)	-	+	-	+	+	+
13.	Glycosides (Keller-Kiliani Test)	-	+	+	-	+	-
14.	Terpenoids (Salkowski test)	+	-	+	-	+	-
15.	Phenols compounds (Ferric chloride test)	-	+	-	-	+	+
16.	Carbohydrates (Molisch test)	-	+	+	+	-	-

***(CE; chloroform extract, AWE; acetone:water extract)**

Here, steroid, phytostetol, tannin, coumerins, flavonoids, carbohydrate, reducing sugar, amino acids, protein, glycosides, terpenoids and phenols compounds total 12 chemical present in Rodophyta classes. In which Phiobatannis is not-present in this class.

Chart:3 *Rhodophyta* seaweed phytochemicals

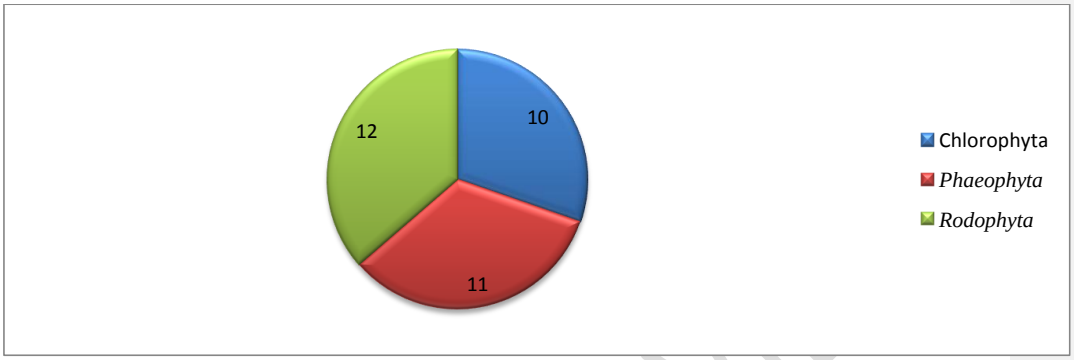


In rodophyta class total twelve phytochemical are present out of thirteen. And (A,B,C) indicates that particular algae name and present of phytochemical in any one or both solvent extract. 1,2,3 shows the particular phytochemical present in how many algae species.

Table:4 Class wise phytochemicals.

Sr. No.	Class	Total seaweeds species	Present phytochemical
1.	*Chlorophyta*	3 (A,B,C)	10
2.	*Phaeophyta*	3 (A,B,C)	11
3.	*Rhodophyta*	3 (A,B,C)	12

Chart: 4 Total noumber of phytochemical present in each class.



In both extracts *Scinaia carnosa, Champia indica* (Rodophyta), *Ulva lactuca* (Chlorophyta) has good source of phytochemical.

Discussion:

Seaweeds are rich in majority of secondary metabolites and hence have high potential of curing many diseases. In the present study seaweed in chloroform and acetone:water extract showed immense ~~rse~~ results justifying its efficiency as medicinal properties. It is also concluded from the results which showed maximum presence of phytochemicals in acetone:water extract class *Rhodophyta* comprises of more phytochemical constituents than that of other two classes. Three seaweed species *Scinaia carnosa, Champia indica* (Rodophyta), *Ulva lactuca* (Chlorophyta),were having rich in secondary metabolites which could be further isolated for biological activities for conforming their role in specific diseases.

Reference:

(1)Abdul Wadood, Mehreen Ghufran, Syed Babar Jamal, Muhammad Naeem, Ajmal Khan,

Rukhsana Ghaffar and Asnad, "Phytochemical Analysis of Medicinal Plants Occurring in Local Area of Mardan", 2013; *Biochemistry & Analytical biochemistry*, 2: 144.

(2)Ashok Kumar, K.K. Jha, Dinesh Kumar, Abhirav Agrawal and Akhil Gupta , "Preliminary Phytochemical Analysis of Leaf and Bark (Mixture) Extract of Ficus Infectoria Plant", 2012; *The Pharma Innovation* Vol. 1

(3)Asthana RK, Tripathi MK, Srivastava A, Singh AP, Singh SP, Nath G. et al. Isolation and identification of a new antibacterial entity from the Antarctic cyanobacterium Nostoc, 2009; 537. J ApplPhycol. 21(1):81-88.

(4) Chapman, A.P. (1998) Seaweeds and their uses, Camelot press, London, 299-300.

(5) Eluvakkal T, Sivakuamr SR, Arunkumar K. Fucoidan in some Indian brown seaweeds found along the coast of Gulf of Mannar. 2010; Int J Botany, 6(2): 176-181.

(5) Goyal M, Pareek A, Nagori B P and Sasmal D, "Aervalanata: A review on phytochemistry and phatmacological aspects, 2011; Pharmacognosy reviews", 5 (10).

(6) Kumar G, karthik L and Rao K B, "Phytochemical composition and in vitro antimicrobial activity of *Bauhinia recemosa* Lamk (caesalpiniaceae)", 2010; *International journal of pharmaceutical science and research,* 1(11), p.51.

(7) Mercy Gospel Ajuru, Light Femi Williams and Gospel Ajuru, "Qualitative and Quantitative Phytochemical Screening of Some Plants Used in Ethnomedicine in the Niger Delta Region of Nigeria" 2017; *Journal of Food and Nutrition Sciences* 5(5): 198-205.

(8) Nidal Jaradat, Fatima Hussen and Anas Al Ali, "Preliminary Phytochemical Screening, Quantitative Estimation of Total Flavonoids, Total Phenols and Antioxidant Activity of Ephedra alata Decne", 2015; *J. Mater. Environ. Sci. 6 (6) 1771-1778.*

(9) P Kumar, S Senthamil Selvi, A Lakshmi Prabha , K Prem Kumar, R S Ganeshkumar and M Govindarajul, Synthesis of silver nanoparticles from Sargassum tenerrimum and screening phytochemicals for its antibacterial activity. 2012. *; "Nano Biomed Eng ISSN 2150-5578.*

(10) Pal A, Sharma, P P Panday, T N, Acharya, R Patel, B R, shukla, V J and Ravishanker B, "Phytochemical evaluation of dried aqueous extract of jivanti *leptadenia reticulate*, 2012. (Ret Z. Wt. et Arn)]", Ayu.33 (4), p. 557.

(11) Reguant, C., A. Bordons, L. Arola and N. Roze, , *" Influence of phenolic compounds on the physiology of Oenococcus*, 2000; *oeni,J.Appl.Microbiol.,88;1065-1071"*

(12) Sivakumar Dhevika*, Balaraman Deivasigamani , PHYTOCHEMICAL PROFILING AND GC-MS ANALYSIS OF *CAULERPA RACEMOSA.* 2018 *"Research journel of life sciences,bioinformatics,pharmaceutical and chemical science"* Publications, RJLBPCS 4(5) Page No.160

(13) Y. Melpha*, N. Manchu and J. Edwin James, Phytochemical evaluation of two brown seaweeds from Muttom and Rasthacaud coasts of Tamil Nadu, India. *2014; "Journal of Chemical and Pharmaceutical Research, , 6(10):566-569"*

(14) Vimala, M. Reginald, M. and Irene Wilsy, J., Phytochemical Analysis In Different Solvent Extracts Of Padina Tetrastromatica, 2015; *" International Journal of Development Research* Vol. 5, Issue, 03, pp. 3761-3763.

(15) Dalia F. Abd Elmegeed, Doaa A. Ghareeb*, Muhammed Elsayed and Muhammad El-Saadani, Phytochemical constituents and bioscreening activities of green algae (Ulva Lactuca), 2014; *International Journal of Agricultural Policy and Research* Vol.2 (11), pp. 373-378.,