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Research Article

PHYTOCHEMICAL STUDIES ON LICHEN (*PARMELIA PERLATA*) AND SEAWEED (*HYPNEA CERVICORNIS*)

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A B S T R A C T

Lichens are a symbiotic association between a fungal and an algal partner while Seaweeds are marine non-flowering plants commonly referred to as macro algae. Both Lichens and Seaweeds are found to possess unique secondary metabolites with different applications most of which are not completely explored. In the present study ***Parmelia perlata***, Lichen that belongs to the family Parmeliaceae, widely consumed as an edible source in India and ***Hypnea cervicornis***, Seaweed that belongs to the family Hypneaceaeare used as they play an important role in different industry but not widely studied. This study was aimed to explore the phytochemical components present in both the Lichen and Seaweed samples. The samples were collected and extracted by means of Cold extraction method using Methanol and water and the extracts thus obtained from both the samples were subjected to qualitative and quantitative analysis of phytochemicals. About 19 phytochemicals such as Glycosides, cardiac glycosides, alkaloids, tannins, phenols, flavanoids, steroids, phytosterols, diterpenes, terpenoids, saponins, resins, quinines, phlobotannins, carbohydrates, proteins, aminoacids, lipids and volatile oil were assessed in the current study. Among the extracts the methanolic extract of both the samples were found to have shown positive result for almost all the phytochemicals compared to that of the aqueous extract. Many of the secondary compounds from these samples still remain unexplored and are not widely studied for their applications so this work is an attempt to identify the presence of such beneficial compounds in both Lichen and Seaweed that could prove to be useful for different applications.

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INTRODUCTION

Lichens are considered to be a symbiotic association between a fungal and a photosynthetic partner which is usually an algae or Cyanobacterium. They are widely distributed in all terrestrial habitats and are found to exist in different growth forms such as Fruticose that appear as shrubby forms with branches, Crustose that spreads over the surface and Foliose that appear as leafy forms [1]. They produce numerous secondary metabolites which have enormous applications and are widely used in the treatment of various diseases like arthritis, eczema, respiratory disorder, pulmonary diseases and also possess anti-inflammatory, antibiotic, analgesic and antipyretic properties [2]. They are also utilized in the production of paint, alcohol, in perfumes and in pharmaceutical industries. Some species of lichens are also used as anti-diabetic drug [3].

Parmelia perlata (Huds) Ach (family: Parmeliaceae) is a species of lichen that is generally referred to as "Stone flower'' or "Charila" [4].The thallus is dirty white or greyish brown about 5-10cm long. It grows in rosettes and spreads irregularly over the substratum[5]. *Parmelia perlata* was found to contain numerous secondary metabolites which are used as bioindicators of heavy metal pollution such as zinc, lead and copper [6]. The smoke from this lichen relieves headache, heal wounds, increases flow of menses [7]. It helps to maintain normal body temperature, decreases respiratory disorders, reduces inflammations in the body and used as an important ingredient in cosmetics. Its decoction is also given for laryngitis. Currently different herbal preparations for wound healing contain *Parmelia perlata* as the major component.

Fig 1 Lichen (*Parmeliaperlata*)

Seaweeds or marine algae are one of the commercially important sources which belong to the group of non-flowering plants and are found to possess the ability to synthesize

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numerous secondary metabolites which have wide applications in the field of medicine.Seaweeds contain unique Phytochemicals, vitamins and minerals which help inpreventing the free radical formation and play a role as an antioxidant agent. About 700 species of macro algae are reported and over 2,400 secondary metabolites had been isolated from different groups of algae with different biological functions [8]. They are widely utilized in food, cosmetics and nutraceuticals due to their economical and dietary resources. They also possess proteins, carbohydrates, vitamins and minerals which are utilized in animal nutrition[9]. Since it is a renewable resource and easily available seaweeds are widely used as food, fertilizer and fodder from the ancient times.

*Hypnea cervicornis*is a common epiphyte that remains attached to the upper branches of other reef algae in the subtidal region and are widely distributed in Atlantic, Caribbean, Indian and Pacific oceans. They are also referred to as hooked red weed. It measures about 3-30 cm long and occurs in tangled, bushy clumps. This alga remains either attached to rock or on other algae mostly species of *Sargassum* [10]. *Hypnea cervicornis*is theeconomically important seaweed which is used in the production of polysaccharides and has wide applications in different industries especially in the food industry. It produces carrageenan which is used as a binding and smoothing agent in many commercial products such as toothpaste, ice cream, pet foods, etc

Fig 2 Seaweed (*Hypneacervicornis*)

Thus in the present study Phytochemical analysis on both the Lichen (*Parmelia perlata)* and Seaweed (*Hypnea cervicornis*) samples were carried out and determined.

MATERIALS AND METHODS

Sample Preparation

Dried samples of Lichen *Parmelia perlata* were collected from the local market whilethe Seaweed *Hypnea cervicornis*samples were collected manually from Pazhaverkadu brackish water area. They were cleaned, washed under tap water and distilled water several times to remove the dirt and were dried for about 3 days and powdered using a mixer. The powdered samples were stored in clean bottles for further use.

Preparation of Extract

The crude extracts from both the Lichen and Seaweed samples were obtained by means of cold extraction method using methanol and water. For methanolic and aqueous extract about two separate 50g of the powdered lichen and seaweed samples were added to 500ml of methanol and 500 ml of double distilled water in separate conical flasks, covered with aluminum foil and kept on a rotary shaker for 3 days at room temperature. The extracts thus obtained were filtered with the help of Whatman No.1 filter paper and the filtrates obtained were evaporated.The dried extracts were then dissolved in methanol or double distilled water and utilized for further phytochemical analysis.The yields of respective extracts werecalculated as:

Percentage yield (%) = (dry weight of extract/dry weight of samples) × 100.

Phytochemical analysis

Qualitative analysis

Test for Glycosides: To 1ml of extract add 1ml of glacial acetic acid and 1ml of conc.sulphuric acid. Appearance of reddish brown colour at the junction of 2 layers and the upper layer turns bluish green indicates the presence of glycosides.

Test for Cardiac glycoside: To 1 ml of extract add 1ml of sodium nitroprusside.Appearance of blood red colour indicates the presence of cardiac glycosides.

Test for Alkaloids: To 2ml of extract add 2-3 drops of Hagers reagent. Appearance of yellow precipitate or yellow solution indicates the presence of alkaloids.

Test for Tannins: To 1ml of extract add few drops of 1% lead acetate. Formation of red / yellow precipitate indicates the presence of tannins.

Test for Flavanoids: To 1ml of extract add few drops of lead acetate solution. Formation of white or yellow precipitate indicates the presence of flavanoids.

Test for Phenols: To 1 ml of extract add 0.5ml of distilled water, 0.5ml of sodium carbonate and few drops of folin-ciocalteau reagent. Appearance of blue/green colour indicates the presence of phenols.

Test for Terpenoids: To 1ml of extract add 1ml chloroform and 1ml of concentrated sulphuric acid. Formation of reddish brown ring indicates the presence of terpenoids.

Test for Diterpenes: To 1ml of extract add 0.5ml distilled water and 1ml of copper acetate solution. Formation of emerald green colour indicates the presence of diterpenes.

Test for Steroids: To 1ml of extract a few drops of concentrated sulphuric acid was added and shaken. Formation of red colour at the lower layer indicates the presence of steroids.

Test for Phytosterols: To 1ml of extract add 2ml of chloroform and few drops of concentrated sulphuric acid. Formation of golden yellow colour indicates the presence of phytosterols.

Test for Saponins: To 1ml of extract add 1ml of distilled water, kept in water bath and they are shaken well. Existence of froth formation indicates the presence of saponins.

Test for Resins: To 1ml of extract add 1ml of acetone and 1ml of distilled water and shake it well. Appearance of turbidity indicates the presence of resins.

Test for Quinones: To 1ml of extract add few drops of concentrated sulphuric acid**.** Formation of red colour indicates the presence of Quinones.

Test for Carbohydrates: To 1ml of extract add 2 drops of - naphthol and few drops of concentrated sulphuric acid**.** Appearance of reddish violet ring indicates the presence of carbohydrate.

Test for Proteins: To 1ml of extract add 4% sodium hydroxide, 1% copper sulphate and is heated**.** Formation of yellow/orange colour indicates the presence of proteins.

Test for Aminoacid: To 1ml of 1% ninhydrin reagent is added and gradually heated**.** Appearance of blue/violet colour indicates the presence of aminoacid.

Test for Lipids: To 1ml of extract add 5ml of chloroform, 5ml of water and is shaken**.** Formation of a cloudy white emulsion indicates the presence of lipids.

Test for Volatile oil: To 1ml of extract add few drops of dilute sodium hydroxide, dilute hydrochloric acid and shaken.Formation of white precipitate indicates the presence of volatile oil.

Test for Phlobotannins: To 1ml extract add 1% aqueous hydrochloric acid and was boiled**.** Formation of red precipitate indicates the presence of phlobotannins.

Quantitative Analysis

Estimation of Phenol: Phenol estimation was carried out by means of Folin-ciocalteau method.Different concentration of extracts were taken (20, 40, 60, 80 mg/ml) and to that 2.5ml of 10% Folin-ciocalteau reagent dissolved in water was added followed by the addition of 2.5 ml of 7.5% sodium carbonate.0.5ml of methanol along with 2.5 ml of FC reagent and 2.5ml of sodium carbonate served as blank. It was incubated for about 45 minutes at room temperature and absorbance was determined at 765nm using spectrophotometer**[11].**

Estimation of Flavanoid: Flavanoid estimation was carried out by means of Aluminium chloride colorimetric method.Different concentrations of extracts were taken (20, 40, 60, 80 mg/ml) and to that 4ml of distilled water is added. To this 0.3ml of 5% sodium nitrite and 0.3ml of 10% aluminium chloride was added and mixed after 5 minutes. This was treated with 2ml of 1M sodium hydroxide after 1 min. The absorbance was measured at 510nm.

Estimation of Tannins: Different concentration of extract was taken (20, 40, 60, 80 mg/ml) in a test tube and to that 100mg of Polyvinylpyrrolidone (PVP) and 500µl distilled water was added. It was then kept for incubation at 4ºc for about 4 hours and centrifuged at 5,000rpm for about 5 minutes.20µl of supernatant was taken and absorbance was measured at 725nm using a colorimeter.

Estimation of Alkaloids: Different concentration of extracts were taken (0.2,0.4,0.6,0.8 g) and to that 200 ml of 10% acetic acid in ethanol was added, covered and allowed to stand for 4 hours. The solution was then filtered and the extract was concentrated on water bath to half the volume. Concentrated ammonium hydroxide was added drop wise until precipitation was completed. It was allowed to settle and the precipitate collected was washed with dilute ammonium hydroxide, filtered and the residue obtained is alkaloid which was dried and weighed **[12].**

Alkaloid content (%) = Weight of alkaloid extracted/ Weight of the sample×100

Estimation of Glycosides: Different concentrations of extracts were taken (20, 40, 60, 80 mg/ml) and to that 10 ml of Baljet's reagent (Freshly prepared 95ml of 1% picric acid and 5ml of 10% sodium hydroxide) was added and allowed to stand for 1 hour. The solution was diluted with20 ml distilled water and is gently mixed. The intensity of colour was read against blank at 495nm using spectrophotometer. The concentration percentage was calculated using the formula:

Concentration (%) = Absorbance×100 / 17 g%

Estimation of Steroids: Different concentrations of extracts were taken (20, 40, 60, 80mg/ml) in different test tubes and to that 5ml of ferric chloride diluting reagent was added .Then 4ml of concentrated sulphuric acid was added and kept for 30 mins incubation at room temperature.5ml of diluting reagent serves as blank .Intensity/absorbance was measured at 540nm in a colorimeter **[13].**

Estimation of Terpenoids: Different concentrations of extracts were taken (2, 4, 6, 8g/ml) and soaked in alcohol for 24 hours at room temperature. The solution was filtered and the filtrate obtained was extracted with petroleum ether and the ether extract obtained was treated as total terpenoids which was dried and weighed **[14].**

Analysis of Nutritional Components

Estimation of Carbohydrates: The carbohydrate estimation was carried out by means of Phenol-sulphuric acid.Different concentration of working standard Glucose (0.2, 0.4, 0.6, 0.8mg/ml) was added to all test tubes along with the sample. The volume was made upto 1ml using distilled water this is followed by the addition of 1ml phenol and 5ml sulphuric acid. Shaken for about 10 minutes and incubated in boiling water bath at 25-30ºc for 20 mins. Green colour developed was read at 490nm and standard graph was plotted for glucose from which the carbohydrate was determined **[15].**

Estimation of Protein: The protein estimation was carried out by means of Lowry's method.Pipette out various concentrations of working standard Bovine serum albumin (BSA) and extract in triplicates into a series of test tube. The volume in all test-tube is made upto 1ml using distilled water. Tube with 1ml water serves as blank.5ml of Reagent – I was added to each tube and allowed to stand for 10 minutes. After 10 minutes 0.5ml of Reagent – II was added, mixed and incubated at room temperature for 30 minutes. Blue colour developed was read at 660nm in a colorimeter. A standard graph was plotted from which protein content was determined **[16].**

Estimation of Aminoacid: The Aminoacid estimation was carried out by means of Ninhydrin method. Different concentration of working standard Leucinewas added to all test tubes along with the extract.It was made upto 2ml with distilled water.This is followed by the addition of 2ml of ninhydrin reagent and is kept in boiling water bath for about 15 minutes.Then 3ml of 50% ethanol was added to all tubes and the colour developed was read at 570nm in a colorimeter. A standard graph was plotted from which the aminoacid content was estimated.

Estimation of Lipids: 1g of dried powder samples were taken in two test tubes. About 5 ml of Chloroform: Methanol (2:1) mixture was added and covered with foil. It was then incubated at room temperature for about 24 hours and after incubation it was filtered and the filtrate was collected in a beaker and kept on hot plate. It was allowed to evaporate leaving a residue at the bottom which was weighed. The difference between the beaker with residue and empty beaker gives the weight of lipid present in the sample**[17].**

RESULTS AND DISCUSSION

Yield of extracts

The Lichen *(Parmelia perlata)* and Seaweed *(Hypnea cervicornis)* samples were extracted by means of cold extraction method using methanol and water (aqueous extract). Methanol has a polarity index of 5.1 and was found to be capable of dissolving polar compounds. Therefore methanol was highly preferred and the solvent was also reported to have been used by other authors for their extraction purposes [18]. The Percentage yield of Lichen crude extract was found to be 2.56 % and that of Seaweed crude extract was found to be 3.16 %(Table 1) and it has been reported to be the total yield for about 50 grams of the dry weight of the sample[19].

Table 1 Estimation of percentage yield of Lichen and Seaweed crude extracts

S.No	Sample	Dry Weight of Sample (g)	Dry Weight of Extract (g)	Percentage Yield (%)
1	LICHEN *(Parmeliaperlata)*	50 Grams	1.28 Grams	2.56 %
2	SEAWEED *(Hypneacervicornis)*	50 Grams	1.58 Grams	3.16 %

Qualitative Phytochemical Analysis

Qualitative phytochemical analysis revealed the presence of compounds such as glycosides, alkaloids, tannins, flavanoids, phenols, terpenoids, carbohydrates, proteins and aminoacids in both the Lichen as well as Seaweed samples (Table 2). The compounds are found to exhibit different activities wherein alkaloids are found to show cytotoxic activity, steroids are found to exhibit insecticidal, antimicrobial and antiparasitic activites while tannins are used as antibacterial and antioxidant agents respectively[20].

Estimation of Total Phenol

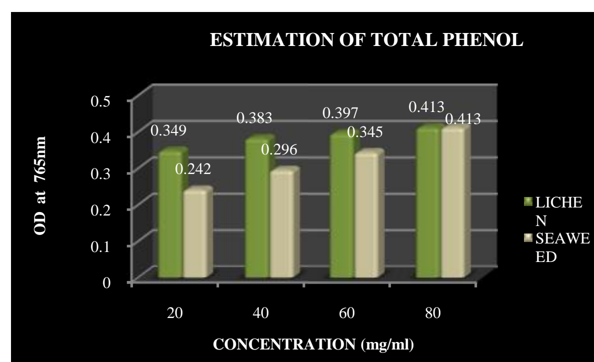

Fig 3 Shows the absorbance of Phenol inLichen and Seaweed at different concentrations.

The total phenol estimation have been reported in both the Lichen and Seaweed samples at different concentrations ranging from 20 to 80 mg/ml wherein the absorbance of phenol was found to increase with increasing concentration of sample and among the two samples Lichen ***(Parmelia perlata)*** was found to show an increased absorbance when compared to that of Seaweed ***(Hypnea cervicornis)*** sample **(Fig 3).** Maximum absorbance was reported to be at an increased concentration of sample. Phenols are also known as carbolic acid. They are mainly used in the development of drugs to treat diarrhea associated with anti-HIV treatment.Phenol exhibits wide applications and are generally used as dietary supplements with high pharmaceutical application.

Estimation of Flavanoids

The absorbance of flavanoid was recorded at different concentrations and was found out to be higher at a maximum concentration of 80mg/ ml in both the samples and not much work has been reported on the analytical profiles of *Hypnea cervicornis* seaweed. The absorbance of flavanoid was estimated to be a little higher with absorbance to be 0.35 at a concentration of 80mg/ml in Lichen *Parmelia perlata* than the seaweed sample with absorbance of 0.27 (Fig 4).

Table 2: Qualitative Phytochemical analysis of Lichen *(Parmeliaperlata)* and Seaweed *(Hypneacervicornis)*

S.NO	Phytochemicaltest	LICHEN *(Parmeliaperlata)*		SEAWEED *(Hypneacervicornis)*	
		METHANOL	AQUEOUS	METHANOL	AQUEOUS
1	Glycoside	Positive (+)	Positive (+)	Positive (+)	Positive (+)
2	Cardiac Glycoside	Positive (+)	Negative (-)	Positive (+)	Negative (-)
3	Alkaloids	Positive (+)	Positive (+)	Positive (+)	Positive (+)
4	Tannins	Positive (+)	Positive (+)	Positive (+)	Negative (-)
5	Flavanoids	Positive (+)	Negative (-)	Positive (+)	Positive (+)
6	Phenols	Positive (+)	Positive (+)	Positive (+)	Positive (+)
7	Terpenoids	Positive (+)	Positive (+)	Positive (+)	Negative (-)
8	Diterpenes	Negative (-)	Negative (-)	Negative (-)	Positive (+)
9	Steroids	Positive (+)	Positive (+)	Positive (+)	Positive (+)
10	Phytosterols	Positive (+)	Positive (+)	Positive (+)	Negative (-)
11	Saponins	Positive (+)	Positive (+)	Positive (+)	Positive (+)
12	Resins	Negative (-)	Negative (-)	Negative (-)	Negative (-)
13	Quinones	Positive (+)	Negative (-)	Negative (-)	Negative (-)
14	Carbohydrates	Positive (+)	Negative (-)	Positive (+)	Negative (-)
15	Proteins	Positive (+)	Negative (-)	Positive (+)	Negative (-)
16	Aminoacid	Positive (+)	Negative (-)	Positive (+)	Negative (-)
17	Lipids	Positive (+)	Negative (-)	Positive (+)	Negative (-)
18	Volatile oil	Positive (+)	Negative (-)	Positive (+)	Negative (-)
19	Phlobotannins	Negative (-)	Negative (-)	Negative (-)	Negative (-)

Quantitative Phytochemical Analysis

The quantitative estimation was carried out for some of the phytochemicals which gave a positive result in qualitative analysis for both the samples such as phenols, flavanoids, tannins, steroids, alkaloids, glycosides and terpenoids.

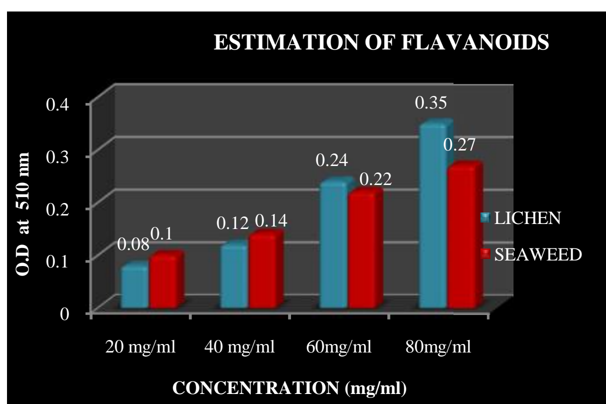

Fig 4 Shows the absorbance of Flavanoid inLichen and Seaweed at different concentrations.

Estimation of Total Tannin

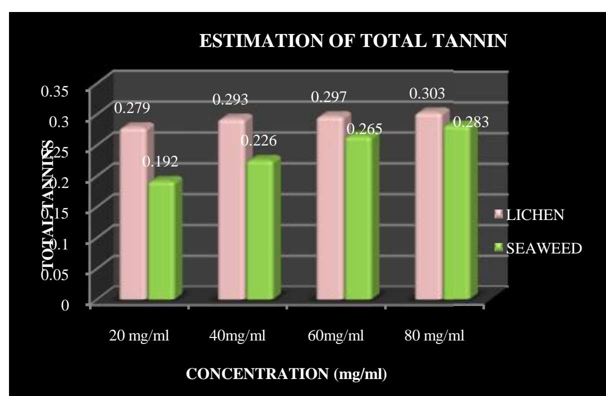

Fig 5 Shows the total tannin content of Lichen and Seaweed at different concentrations

The total tannin content was estimated by calculating the difference between the absorbance of total phenol and free phenol. Lichen sample was found to show an increased absorbance of 0.303 at a highest concentration of 80mg/ml than the seaweed sample with an absorbance of 0.283**(Fig 5).**Total tannin content was found to increase in both the samples with increasing concentration and among both the samples Lichens were found to have shown increased tannin content compared to that of Seaweed.

Estimation of Alkaloid

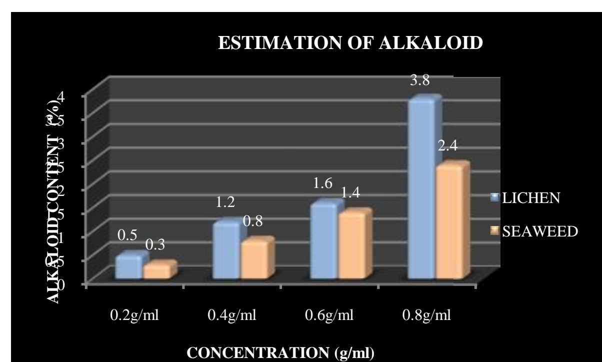

Fig 6 Shows the total alkaloid content % in Lichen and Seaweed at different concentrations

The samples were taken at different concentrations (0.2, 0.4, 0.6, 0.8g/ml) to estimate the total alkaloid content in both the sample. The percentage of alkaloid in both the samples were found to be higher at 0.8g/ml wherein Lichen was found to show higher alkaloid content than the Seaweed sample (Fig 6). Crude extract of alkaloids are harmful so when they are purified and combined with another compound it could be used for the synthesis of medicinal drugs. The alkaloid was compared with the value of the *Gracillariacortica* and was found to be much high in the seaweed *Hypnea cervicornis.*

Estimation of Glycosides

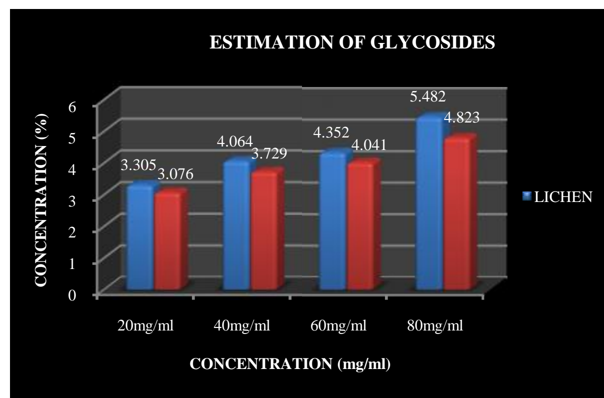

Fig 7 Shows the Glycoside content in Lichen and Seaweed samples at different concentrations

Glycosides are potential compounds with wide applications in pharmaceutical studies. The estimation was carried out at different concentrations and the glycoside content was found to be higher at an increased concentration.Lichen sample was found to show an increased concentration of about 5.482% at 80mg/ml than the seaweed sample with concentration of 4.823% (Fig 7).

Estimation of Steroids

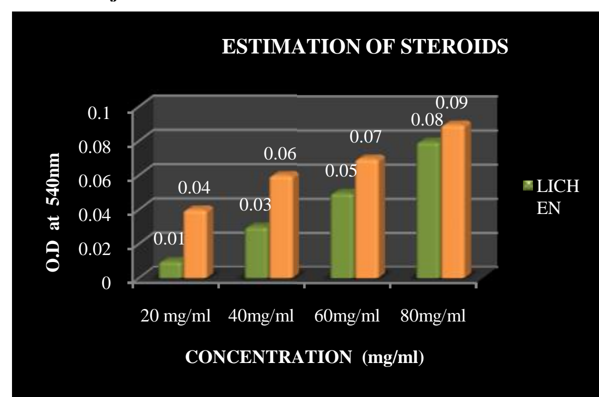

Fig 8 Shows the Steroid content in Lichen and Seaweed samples at different concentrations

Steroids are found to exhibit insecticidal, antimicrobial and anti parasiticactivites. The absorbance of steroid content was recorded at different concentrations of the extract wherein the Seaweed *(Hypnea cervicornis)* sample was found to show increased absorbance compared to that of Lichen *(Parmelia perlata).* Seaweed sample was found to show an increased absorbance of about 0.09 at a highest concentration of 80mg/ml than the lichen sample with absorbance of 0.08(Fig 8).

Estimation of Terpenoids

The Total Terpenoid content was estimated and recorded to be higher at a concentration of 8g/ml in both the samples (Fig 9). The Total Terpenoid content was found to increase with increasing concentration. The Lichen sample was found to show an increased Terpenoid content compared to that of the

Seaweed sample. Terpenoids are reported to possess different applications such as antimicrobial, insecticidal and Pesticidal property.

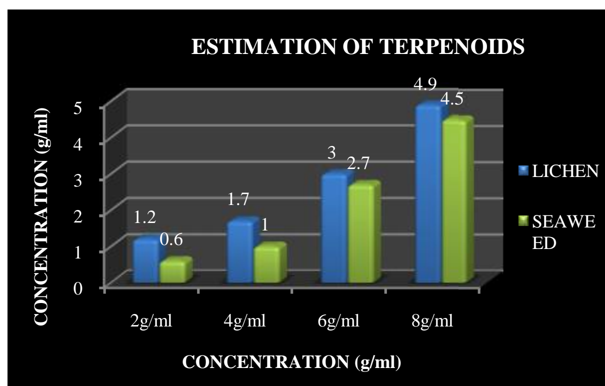

Fig 9 Shows the Total Terpenoid content in both the Lichen and Seaweed samples at different concentrations.

Assessment of Nutritional components

Table 3 Shows the assessment of nutritional components in both Lichen and Seaweed samples

S. no	Standard and Sample	Volume of Standard and Sample (ml)	Carbohydrate (Glucose)	Protein (Bovine serum albumin)	Aminoacid (Leucine)
			O.D at 490nm	O.D at 660nm	O.D at 570nm
1	S_1	0.2	0.04	0.06	0.02
2	S_2	0.4	0.08	0.11	0.04
3	S_3	0.6	0.12	0.17	0.06
4	S_4	0.8	0.16	0.23	0.08
5	S_5	1	0.20	0.29	0.10
6	U_1 (Lichen)	0.1	0.11	0.12	0.03
7	U_2 (Seaweed)	0.1	0.09	0.08	0.01

Based on the Optical Density (O.D) value the standard graph was plotted from which the concentration of Carbohydrates, proteins and aminoacids in both the Lichen and Seaweed samples were estimated. The Carbohydrate estimation was carried out by Phenol-sulphuric acid method in which the concentration of carbohydrate in Lichen was found out to be 52mg/ml and that in seaweed was 44 mg/ml and comparatively Lichen was found to show an increased concentration of carbohydrate than seaweed**.**The Protein estimation was carried out by Lowry's method in which the concentration of Protein in Lichen was found out to be 42mg/ml and that in seaweed was 28 mg/ml and comparatively Lichen was found to show an increased concentration of protein than seaweed**.** The Aminoacid estimation was carried out by Ninhydrin method in which the concentration of aminoacid in Lichen was found out to be 26mg/ml and that in seaweed was 20 mg/ml and comparatively Lichen was found to show an increased concentration of aminoacid than seaweed(Table 3).

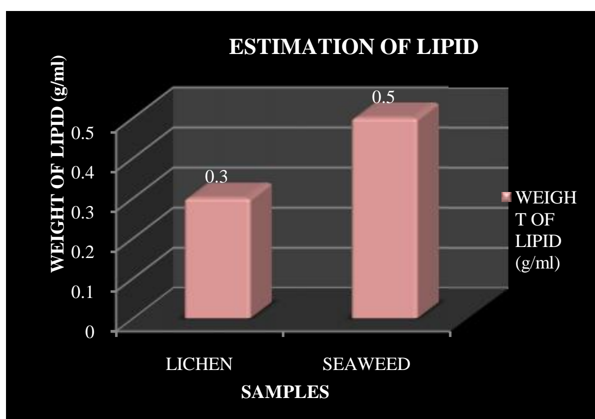

Fig 10 Shows the total lipid content in both the Lichen and Seaweed samples

Estimation of Lipid

The total lipid content was found to be higher in Seaweed *Hypnea cervicornis*with 0.3g/ml compared to that of Lichen *Parmelia perlata* sample with lipid content of about 0.5g/ml (Fig 10). Comparatively the Concentration of carbohydrate, protein and aminoacid was found to be higher in Lichen when compared to that of Seaweed while in case of Lipid content weight of the lipid was found to be higher in seaweed compared to that of lichen.

CONCLUSION

The present work deals with the phytochemical studies on Lichen (*Parmelia perlata*) and Seaweed (*Hypnea cervicornis*).

The qualitative and quantitative estimation of phytochemicals along with the nutritional components such as Carbohydrates, proteins, aminoacids and lipids were also determined. The phytochemicals that were extracted from both the lichen and seaweed samples such as alkaloids, flavanoids, terpenoids, phenols and tannins exhibit a wide range of medicinal properties wherein the compounds such as Phenol exhibits wide applications and are generally used as dietary supplement, alkaloids are found to show cytotoxic activity, steroids are found to exhibit insecticidal, antimicrobial and anti parasitic activites while tannins are used as antibacterial and antioxidant agents respectively. Compounds derived from these natural sources are found to be highly beneficial and can be used for many pharmacological and also in other industrial applications. The products derived from these natural sources were found to pose good health benefits as nutraceuticals and can also be used for deriving biologically active metabolites or compounds in order to design or develop therapeutically important drugs without any side effects. Most of the secondary compounds from lichen and seaweeds still remain unexplored so efforts have to be made to screen these bioactive compounds to be used in different applications.

References

1. Carcia-Rowe J, Saiz-Jimenez C (1991): Lichens and bryophytes as agents of deterioration of building material in Spain cathedrals. *Intern Biodeter*, 28: 151 163.
2. Lawrey, JD. (1986). Biological role of lichen. *Bacillus subtilis*, *Proteus vulgaris*, *Aeromonas* substances *J. Bryol.* 89(2): 111-122.

3. Baytop, T (Ed.2). Therapy with Medicinal Plants in Turkey (Past and Present). Istanbul University publication, Istanbul. 233,1999.
4. Kiritikar KR and Basu BD(Ed.3). Indian Medicinal plants. Lalit Mohan Basu M.B publications. Allahabad, pp 275, 1987.
5. K.R. Kiritikar and B.D. Basu (Ed.2). Indian Medicinal plants. Lalit Mohan Basu M.B publications. Allahabad, vol. 3, 1956.
6. Momoh MA, Adikwu MU. (2008) Evaluation of the effect of colloidal silver on the antibacterial activity of ethanolic extract of the lichen Parmelia perlata. *Afri J Pharm and Pharmacol*; 2(6):106-109.
7. Lindley J (Ed.1).The Flora Medica. Pub. Ajay Book Service. New Delhi, 1981.
8. Faulkner DJ. (Ed.2) Marine natural products.*Nat. Products Rep*; 19: 1-48, 2002.
9. Sara Marsham, Graham W. Scott, and Michelle L. Tobin, (2007). Comparison of nutritive chemistry of a range of temperate seaweeds. *Food Chemistry*, 100: 1331-1336.
10. Littler DS, Littler MM, Bucher KE, Norris JN (Ed.3). Marine Plants of the Caribbean, a Field Guide from Florida to Brazil. Smithsonian Institution Press, Washington DC, 1989.
11. Singleton, VL, Orthofer, R., Lamuela-Raventos, RM. (1999): Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-Ciocalteu reagent. *Methods Enzymol*. 299: 152-178.
12. Harborne JB (Ed.3). Phytochemical Methods. Chapman and Hall, Ltd., London, pp. 49-188, 1973.
13. Zak, B., Dickenman, RC, White, EG, Burnett, H., and Cherney, PJ (1954), Rapid estimation of free and total cholesterol. *Am. J. Clin. Path*., 24: 1307.
14. Ferguson, NM. (Ed.1). A Text book of Pharmacognosy. Mac Milan Company, New Delhi. pp. 191, 1956.
15. Dubois, M., K. A. Gilles, J. K. Hamilton, P. A. Rebers, and F. Smith. (1956). Calorimetric method for determination of sugars and related substances.*Anal. Chem*. 28: 350- 356.
16. Lowry, OH, Rosebrough, NJ, Farr, AL., and Randall, RJ. (1951) Protein measurement with the Folin phenol reagent. *J. Biol. Chem*. 193, 265-275.
17. Folch, J., Ascoli, I., Lees, M., Meath, J A., and Lebaron, (1951). *F. N. J. Biol. Chern*. 191: 833
18. HafizurRahman, VijayaB, SoumyaGhosh, Geetika Pant, Sibi G (2014) In vitro studies on antioxidant, hypolipidemic and cytotoxic potential of Parmelia perlata. *American Journal of Life Sciences*;2(6-1):7-10.
19. A.Mastan, B.Sreedevi, J.PramodaKumari (2014) Evaluation of the in vitro Antioxidant and Antibacterial Activities of Secondary Metabolites produced from Lichens.*Asian Journal of Pharmaceutical and Clinical Research*,7(1) :193-198
20. Sibi G, Apsara V, Dhananjaya K, Ravikumar KR and Mallesha H (2013) Phytochemical and Antibacterial properties of spices against food borne bacteria with special reference to Parmelia perlata *G.J.B.B.,*Vol.2(2):145-149.

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