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TOTAL PHENOLIC CONTENTS OF SOME SEAWEED COLLECTED FROM RAIGAD COASTS OF KONKAN (MS).

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ABSTRACT

To study total phenolic contents of seaweed, five species like *Cladophora glomerata, Ulva intestinalis, Ulva lactuca, Saragassum cinerum* and *Gracillaria corticata* were collected from the coast of Raigad district of Konkan of Maharashtra State. Total phenolic contents of selected seaweeds were carried out separately by solvent extracts like ethanol, ethyl acetate, methanol, chloroform, benzene and petroleum ether using standard methods. Total phenolic contents of five seaweeds were showed variations. The present study proves that these seaweeds may be used as antioxidant source for human beings after detail investigation.

KEYWORDS: Seaweeds; organic solvent; Total phenolic contents; Raigad coast of Konkan.

INTRODUCTION

Seaweeds belong to a group of marine plants known as algae. Seaweeds are classified as green algae (Chlorophyta), Brown algae (Phaeophyta) and Red algae (Rhodophyta). This classification of algae is based on nutrients and chemical composition present in it. Algae considered as ecologically and biologically important component in the marine ecosystems. Seaweeds make a substantial contribution to marine primary production and provide habitat. Marine algae are the group of plants that live in aquatic environment (Deodhar, H.D. 1989).

Seaweeds contain more than sixty 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).

In addition to vitamins and minerals, seaweeds are also potentially good source of proteins, polysaccharides, fibers, pigments, phenols, vitamins like A,B,C,D and E etc. Marine algae are considered as a source of bioactive compounds as they are able to produce a great variety of secondary metabolites characterized by a broad spectrum of biological activities (Zubia M, R. D.P. 2007).Compounds with antibacterial, antiviral, antifungal, antioxidant activities have been detected in green, brown and red algae (Yuan et al., 2005). The present study was aimed to show the total phenolic contents of five seaweeds collected from coast of Raigad district of Konkan.

MATERIALS AND METHODS

Collection of Seaweeds

In the present investigation, samples of seaweeds, *Cladophora glomerata* (Linneus) kutzing, *Ulva intestinalis* (Linnaeus) Nees, *Ulva lactuca* Linnaeus, *Saragassum cinerum* J.Agardh, and *Gracillaria corticata* J.Agardh were collected from the Raigad coast line (17^{o} 53' and 19^{o} 08' North Latitude and 72^{o} 51' and 73^{o} 42' East Longitude) of Konkan region of Maharashtra, during low tides. The collected macro marine algal samples were washed in sea water and fresh water thoroughly to remove the epiphytes and other contaminations. Then samples were transferred into a polythene bags with a small hole to leak out water drop wise and then shade dried.

Collection of seaweeds was done in labeled polythene bags and brought to laboratory. Then marine algal samples were analyzed macroscopically for their morphological characters like colour, shape, size, texture etc. Then collected species of macro algae were preserved in 4% formalin solution. Herbarium specimens of each species were prepared for identification and confirmation of their taxonomic position. Identification of species was done by referring Taylor (1960), Deodhar (1987) and Sahoo Dinabandhu (2001) and other previous publications.

Preparation of sample for total phenolic contents

For total phenolic contents, fresh seaweed samples were used. Five grams of fresh sample weighed and homogenized with 50 ml of ethanol, ethyl acetate, methanol, chloroform, benzene and petroleum ether solutions separately. The extract was boiled for one hour, cooled and filtered. The filtrate was used for screening total phenolic contents by using

standard procedure (Harborne, 1973). Total phenolic content in algal extracts were determined by using modified Folin-Ciocalteu reagent method. According to (Zahin, *et al* 2009) Gallic acid is a standard phenolic compound. The reaction mixture contained various concentrations of the extracts and Folin-Ciocalteu reagent. To 500 µL (10 mg/ml) of seaweed extracts in methanol, 2.5 ml of 1:10 dilution of Folin-Ciocalteu's reagent and 2 ml of $Na2CO_3$ (7.5% w/v) were added and mixed thoroughly and incubated at 45 ^{o} C for 15 minutes. Same procedure is followed for other algal extracts with benzene, chloroform, ethanol, ethyl acetate, methanol and petroleum ether respectively. The absorbance measured at 765 nm. Blank is all without the extract. The concentration of total phenolic content in the algal extracts was determined as milligrams of Gallic acid equivalent per gram of dry weight (mg GAE/g DW) (Zahin, *et al*., 2009).

1. Total phenolic contents of *Cladophora glomerata*

Total phenolic contents of *Cladophora glomerata* in different extracts, obtained in this study are presented. From this results, total phenolic contents of *Cladophora glomerata* in different extracts like benzene, chloroform, ethanol, ethyl acetate, methanol and petroleum ether showed as 14.35, 13.64, 31.61, 70.02, 73.49 and 6.41 (mg Gallic acid/100 g dried seaweed) respectively.

Total phenolic contents of *Cladophora glomerata***,** Methanol extract showed phenolic contents, i.e. 73.49 (mg Gallic acid / 100 g dry weight of seaweed), had significantly higher contents than other solvent extracts, followed by ethyl acetate extracts (70.02), ethanol extracts (31.61), extracts of benzene (14.35), chloroform extracts (13.64), and petroleum ether extracts, showed lowest value, 6.41(mg Gallic acid / 100 g dry weight of seaweed) as compared to other solvent extracts.

2. Total phenolic contents of *Ulva intestinalis*

The total phenolic contents of *Ulva intestinalis* in different extracts, obtained in this study are presented. From this result, total phenolic contents of *Ulva intestinalis* in different extracts like benzene, chloroform, ethanol, ethyl acetate, methanol and petroleum ether showed as 7.13, 54.29, 17.16, 39.52, 36.86, and 3.82 (mg Gallic acid/100 g dried seaweed) respectively.

Total phenolic contents of *Ulva intestinalis*, Chloroform extracts showed i.e. 54.29, (mg Gallic acid/100 g dried seaweed) had significantly higher contents than other solvent extracts,

followed by ethyl acetate extracts (39.52), methanol extracts (36.86), ethanol extracts (17.16), benzene extracts (7.13) and petroleum ether extracts, showed lowest phenolic contents 3.82 (mg Gallic acid/100 g dried seaweed) as compared to other extracts.

3. Total phenolic contents of *Ulva lactuca*

The total phenolic contents of *Ulva lactuca* in different extracts, obtained in this study are presented. From this result, total phenolic contents of *Ulva lactuca* in different extracts like benzene, chloroform, ethanol, ethyl acetate, methanol and petroleum ether showed as 8.41, 26.53, 22.02, 21.25, 18.38 and 3.16 (mg Gallic acid/100 g dried seaweed) respectively.

Total phenolic contents of *Ulva lactuca*, Chloroform extracts showed i.e. 26.53, (mg Gallic acid/100 g dried seaweed), had significantly higher contents than other solvent extracts, followed by ethanol extracts (22.02), ethyl acetate extracts (21.25), methanol extracts (18.38), benzene extracts (8.41) and petroleum ether extracts, Showed lowest phenolic contents 3.16 (mg Gallic acid/100 g dried seaweed) as compared to other extracts.

4. Total phenolic contents of *Saragassum cinereum*.

The total phenolic contents of *Saragassum cinereum* in different extracts, obtained in this study are presented. From this result, total phenolic contents of Saragassum cinereum in different extracts like benzene, chloroform, ethanol, ethyl acetate, methanol and petroleum ether showed as 11.46, 59.76, 30.62, 62, 54.45 and 5.87 (mg Gallic acid/100 g dried seaweed) respectively.

Total phenolic contents of *Saragassum cinereum*, ethyl acetate extracts showed phenolic content i.e. 62, (mg Gallic acid/100 g dried seaweed), had significantly higher contents than other solvent extracts, followed by chloroform extracts (59.76), methanol extracts (54.45), ethanol extracts (30.62), benzene extracts (11.46) and petroleum ether extracts showed lowest phenolic content i.e. 5.87, (mg Gallic acid/100 g dried seaweed) as compared to other extracts.

5. Total phenolic contents of *Gracilaria corticata*

The total phenolic contents of *Gracilaria corticata* in different extracts, obtained in this study are presented. . From this result, total phenolic contents of Gracilaria corticata in different extracts like benzene, chloroform, ethanol, ethyl acetate, methanol and petroleum ether showed as 32.50, 15.31, 60.05, 14.05, 60.20 and 5.55 (mg Gallic acid/100 g dried seaweed)

respectively.

Total phenolic contents of *Gracilaria corticata*, methanol extracts showed phenolic contents i.e. 60.20 (mg Gallic acid/100 g dried seaweed), had significantly higher contents than other solvent extracts, followed by ethanol extracts (60.05), benzene extracts (32.50), chloroform extracts (15.31), ethyl acetate extracts (14.05) and petroleum ether extract, showed lowest phenolic contents i.e. 5.55 (mg Gallic acid/100 g dried seaweed) as compared to other extracts.

OBSERVATIONS AND RESULTS

Table No.1: Absorbance at 765 nm for total phenolic contents (mg Gallic acid/100 g dried marine macro algae) of fractions obtained from five seaweeds.

Sr.N	Solvent	Cladophora	Ulva	Ulva	Saragassum	Gracillaria
o	used	glomerata	intestinalis	lactuca	cinereum	Corticata
1	Benzene	0.481+0.034	0.239+0.006	0.282+0.019	0.384+0.032	1.089+0.044
2	Chloroform	0.457+0.062	1.819+0.023	0.889+0.051	2.002+0.026	0.513+0.059
3	Ethanol	1.059+0.025	0.575+0.019	0.738+0.037	1.026+0.046	2.012+0.012
4	Ethyl Acetate	2.346+0.041	1.324+0.015	0.712+0.020	2.077+0.055	0.471+0.034
5	Methanol	2.462+0.048	1.235+0.036	0.616+0.008	1.906+0.023	2.218+0.022
6	Petroleum Ether	0.215+0.032	0.128+0.021	0.106+0.095	0.194+0.007	0.186+0.035

Values are expressed as a mean ± standard error of mean of three observations.

Table No.2: Total phenolic contents (mg Gallic acid/100 g dried macro algae) of seaweeds.

Sr. No	Solvent used	Total phenolic contents of Five seaweeds at 765 nm.				
		Cladophora glomerata	Ulva intestinalis	Ulva lactuca	Saragassum cinereum	Gracilaria Corticata
1	Benzene	14.35	7.13	8.41	11.46	32.50
2	Chloroform	13.64	54.29	26.53	59.76	15.31
3	Ethanol	31.61	17.16	22.02	30.62	60.05
4	Ethyl acetate	70.02	39.52	21.25	62.00	14.05
5	Methanol	73.49	36.86	18.38	54.45	60.20
6	Petroleum ether	6.41	3.82	3.16	5.87	5.55

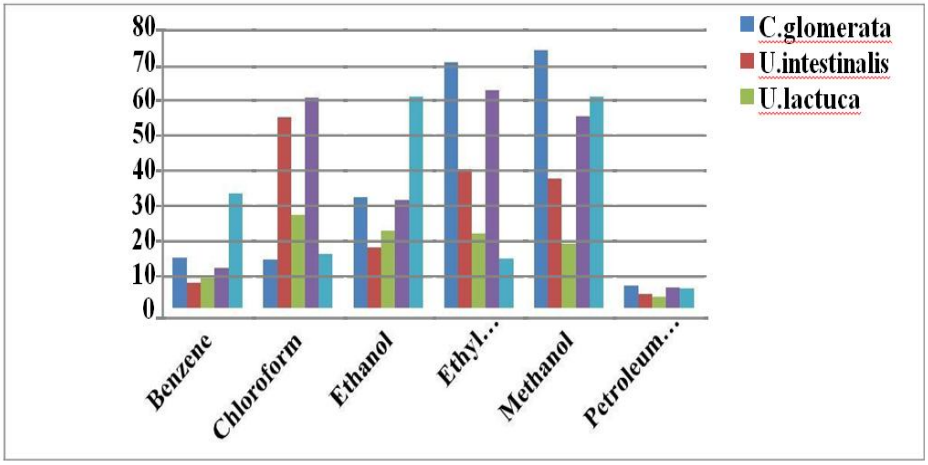

Fig.No.1: graph of Total Phenolic contents of Five seaweeds.

DISSCUSSION

The present study showed total phenolic contents of five seaweeds, (*Cladophora glomerata* (Linnaeus) Kutzing, *Ulva intestinalis* (Linnaeus) Nees, *Ulva lactuca* Linnaeus, *Saragassum cinerum* J.Agardh, and *Gracillaria corticata* J.Agardh). The extracts of methanol showed highest phenolic contents, which is followed by Ethanol, Ethyl acetate, Benzene & Chloroform. The extracts of petroleum ether showed very less phenolic contents. The species, *Cladophora glomerata* showed highest phenolic contents (73.49), followed by *Saragassum cinerum* (62.00), *Gracilaria corticata* (60.20), *Ulva intestinalis* (54.29) and *Ulva lactuca* (26.53).

From these results it can be concluded that these selected five seaweed extracts may show the antioxidant potential. It can be useful as bioactive agents after its detail investigation, which clarifies its bioactivity and bio-efficacy. It is very essential to standardize every marine algal medicine, because of variations observed in phenolic contents. Therefore after completing the preclinical studies, algal drugs and their products need to be standardized by the authentic department of Indian Government.

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