

ABSTRACT

Some selected algal species of Chlorophycota and Phaeophycota were collected from the Karachi coast during the year 2016-2020. Phycochemical and biological activities were performed to analyze *i.e.* florescence analysis, elemental exploration, qualitative and quantitative phycochemistry, antioxidant, antibacterial, antifungal, anthelmintic, antidiabetic of Phylum Chlorophycota algal species *i.e.* *Ulva ohnoi* Hiraoka & Shimada, *Ulva sorensenii* V.J. Chapman, *Ulva compressa* Linnaeus and Phylum Phaeophycota *i.e.* *Padina antillarum* (Kützinger) Piccone, *Sargassum vulgare* Agardh, *Sargassum aquifolium* (Turner) Agardh. The aim of this study was to analyze the phycochemicals and evaluation of antimicrobial, antioxidants, antidiabetic and anthelmintic potential of selected seaweeds of chlorophycota and phaeophycota. The phycochemical tests of the different extracts of selected seaweed species resulted the presence of the alkaloids, terpenoids, saponins, tannins, steroids and phenols. FTIR were performed for all the selected members of Chlorophycota and Phaeophycota to confirm the chemical compounds. The highest phenolic contents were observed in *Padina antillarum* methanolic extract while the lowest value was observed in *Ulva compressa* *n*-hexane extract. The highest flavonoids contents were observed in the methanol extract of *Ulva compressa* while the lowest amount of flavonoid contents were observed in *n*-hexane extract of *Ulva compressa*. In elemental analysis Calcium present in higher amount in all selected species as compare to other minerals such as Potassium, Sodium, Magnesium, Iron, Zinc, Lead and Cadmium was present in the lowest amount among all species. Carbohydrates were present in the highest amount 48.75mg/g in the *Ulva sorensenii* while the lowest amount of carbohydrates in *Sargassum vulgare* (45.28mg/g). The highest amount of total protein present in *Ulva sorensenii* (113.6mg/g) while the lowest amount was present in *Ulva ohnoi* (43.98mg/g). *Padina antillarum* had maximum amount of lipids 4 % as compare to *Ulva sorensenii* and *Ulva compressa* had least amount of lipids as 0.01%.

Pentadecanoic acid was present in all selected species of *Chlorophycota* and *Phaeophycota*. Benzene 1-3-dimethyl and O-xylene present in *Chlorophycota* while Benzene-1-3-dimethyl present only in *Sargassum* species. Tridecenedial, Oxirane tetradecyl, 3,7,11,15, tetra methyl-2-hexadecen-1 and 9 Octadecenoic acid was present in all selected species of *Chlorophycota*. Tetradecane, Pentadecane, Diethyl phthalate, Hexadecane, Detadecane, 9 Octadecadicnoic acid, 9,12 Hexadecadienoic acid, 9, Hexadecenoic acid, Nonadecane, 9,12 Octadecadicnoic acid, 6-Octadecenaic acid, Octadecanoic acid, Nonadecenoic acid, Docosenoic acid were present in *Padina antillarum* member of *Phaeophycota*.

The highest amount of ABTS was present in the methanol extract of *Ulva compressa* 1008.36 mg/ml of Trolox while the lowest amount was observed in *n*-hexane extract of *Padina antillarum* 293.63 mg/ml of Trolox. FRAP maximum amount was observed in *Ulva compressa* methanol extract 2068.64 mg/ml of Trolox. *Sargassum vulgare* chloroform extract had the maximum amount of FTC 110.80 mg/ml while *Padina antillarum* methanol extract had minimum amount 0.165mg/ml of FTC. *Padina antillarum* methanol extract yields 92.42 among all species while 0.15 mg/ml of *Ulva sorensenii* chloroform extract yields minimum % inhibition of metal chelating. TAA maximum amount was observed in *Padina antillarum* methanol extract 911.88 mg/ml of ascorbic acid while the minimum amount was observed in *Ulva compressa* chloroform extract 105.48 mg/ml of ascorbic acid.

Antibacterial activity was performed on some species of Chlorophycota and Phaeophycota against gram positive and gram negative bacteria. Against Bacillus subtilis maximum zone of inhibition was found on Ulva ohnoi methanolic extract 34 ± 1.45 mm while the minimum zone was observed against Ulva compressa n-hexane extract 11.33 ± 5.78 mm. Escherichia coli had maximum zone of inhibition against Ulva compressa methanol extract 24.66 ± 2.72 and minimum zone of inhibition was against Ulva ohnoi 12.66 ± 1.20 . Klebsiella pneumonia showed maximum zone of inhibition against Ulva sorensenii 36.33 ± 0.35 . Staphylococcus aureus showed maximum zone of inhibition against Ulva ohnoi methanol extract 26.33 ± 0.88 . Staphylococcus epidermidis showed maximum zone of inhibition against Sargassum vulgare methanol extract 26.66 ± 0.18 . Following extract showed no zone of inhibition against specific bacteria Sargassum vulgare chloroform extract, Sargassum aquifolium and Padina antillarum n-hexane and chloroform extract against Bacillus subtilis, Ulva compressa chloroform extract, Sargassum aquifolium n-hexane extract and Padina antillarum n-hexane and chloroform extract against Escherichia coli, Sargassum aquifolium n-hexane and Padina antillarum n-hexane and chloroform extract against Klebsiella pneumonia, Sargassum aquifolium, Padina antillarum, n-hexane chloroform extracts against Staphylococcus aureus and Staphylococcus epidermidis. Antifungal activity of seaweeds were evaluating by Aspergillus niger and Penicillium notatum. Aspergillus niger maximum zone of inhibition was shown against Padina antillarum 37 ± 0.012 and minimum shown as Ulva compressa 2.66 ± 0.36 . Penicillium notatum have maximum zone of inhibition against Ulva sorensenii methanol extract 22.97 ± 0.39 and minimum zone of inhibition against Ulva compressa chloroform extract 4.00 ± 0.15 . Sargassum vulgare, Sargassum aquifolium n-hexane and chloroform extract, Padina antillarum, n-hexane extract shown no zone of inhibition against Aspergillus niger and Penicillium notatum while Ulva sorensenii chloroform extract showed no zone against Aspergillus niger and Sargassum vulgare methanol extract showed no zone of inhibition against Penicillium notatum.

Anthelmintic activity showed maximum results on methanolic extract of all members at the lowest concentrations. Antidiabetic results of Phaeophycota were remarkable as *Padina antillarum* methanol extract increase the hemoglobin level of the mice and also control the glucose level.

Three members of chlorophycota and phaeophycota were phytochemicals and bioactivity analyzed. Ca, Fe, K, and Na were found in all selected members. The phycochemical test of the different extracts of seaweeds revealed the presence of alkaloids, terpenoids, saponins, tannins, steroids, and phenols. The highest flavonoids contents were observed in *Ulva compressa* Pentadecanoic acid ($C_{17}H_{34}O_2$) and O-xylene (C_8H_{10}) was abundant among selected species. Among the chlorophycota members *Ulva compressa* showed the highest antioxidant activity while among phaeophycota *Padina antillarum* has the maximum values. The *Padina antillarum* exhibits maximum antibacterial activity while the *Ulva ohnoi* exhibits maximum antifungal activity in six species. six subjected seaweeds have the potential for anthelmintic activity. Three members of chlorophycota inhibit the antidiabetic activity while the members of Phaeophycota have promising results. The finding of this thesis suggests that subjected seaweeds are rich in phytochemical compounds and have the potential for bioactivities