

Antioxidant and
antimicrobial activities of
Sargassum sp.

Introduction:

Natural products from algae have been widely explored, for human use as food and treatments. as medical

Many chemicals and products from algae have economic importance and are broadly used.

Algae are a source of fiber, minerals, antioxidants, vitamins, pigments, steroids, lectins, halogenated compounds, polysaccharides, proteins, polyunsaturated fatty acids and other lipids; thus, they are largely consumed in many countries.

Furthermore, isolated compounds, extracts and fractioned extracts have been reported to yield important biological activities, including anti-inflammatory, decrease in triacylglyceride levels in the liver and serum, for the treatment of Leprosy, as well as for their antioxidant, antinociceptive and anticancer.

Antioxidant activity

Antioxidant

is agent that delays, prevent or remove oxidative damage from a target molecule.

Antioxidant activity

Antioxidant can prevent various diseases by acting as reducing agent, hydrogen donator, free radical scavengers and singlet oxygen quenchers by two pathways:

Enzymatic pathway

Glutathione peroxidase
(GPX)

glutathione-S-
transferase (GST)

Non-enzymatic pathway

β - carotene

Vitamin A

Vitamin E

Vitamin C

Oxidative damage

The oxidative damage caused by reactive nitrogen species and by reactive oxygen species (ROS):

- 1- superoxide anion (O^{2-})
- 2- hydroxyl radicals (OH^{\cdot})
- 3- hydrogen peroxide (H_2O_2)
- 4- singlet oxygen (1O_2)

* Are formed as a result of **normal metabolic activity** and **exogenous sources**

Oxidative damage

* Oxidative stress plays an important role in the **pathogenesis** of various diseases such as:

- **Atherosclerosis**
- **Alcoholic liver cirrhosis**
- **Cancer**
- **Ageing**
- **Coronary heart diseases**
- **Alzheimer's**

ROS caused **cellular and subcellular damage** by:

- Damage of membrane lipids
- Denaturation of cellular proteins
- Breaking DNA strands
- Disrupting cellular functions

Antioxidant activity

The major groups of antioxidant compounds in brown algae:

Carotenoids:

β- carotene
Fucoxanthin
Xanthophyll

Polyphenols:

Flavonoids
Phlorotannins

Sulfated polysaccharides:

Fucoidan
Alginic acid
Sulfated

Vitamin:

Vitamin A

Antioxidant activity

There is some synthetic antioxidants but it have side effects

Butylated Hydroxy Anisole (BHA)

Butylated Hydroxy Toluene (BHT)

Tertiary Butyl Hydro Quinone (TBHQ)

Propyl Gallate (PG)

Antimicrobial activity

Antimicrobial activity depends on both algal species and efficiency on extraction of their active compounds.

*** The major groups of antioxidant compounds in brown algae:**

- Unsaturated fatty acids
- Organic acids
- Phenols
- Antiviral, antibacterial and/or antifungal activities related to marine algae against several pathogens were investigated.

Sargassum sp.

Kingdom: *Protoctista*

Division: *Heterokontophyta*

Class: *Phaeophyceae*

Order: *Fucales*

Family: *Sargassaceae*

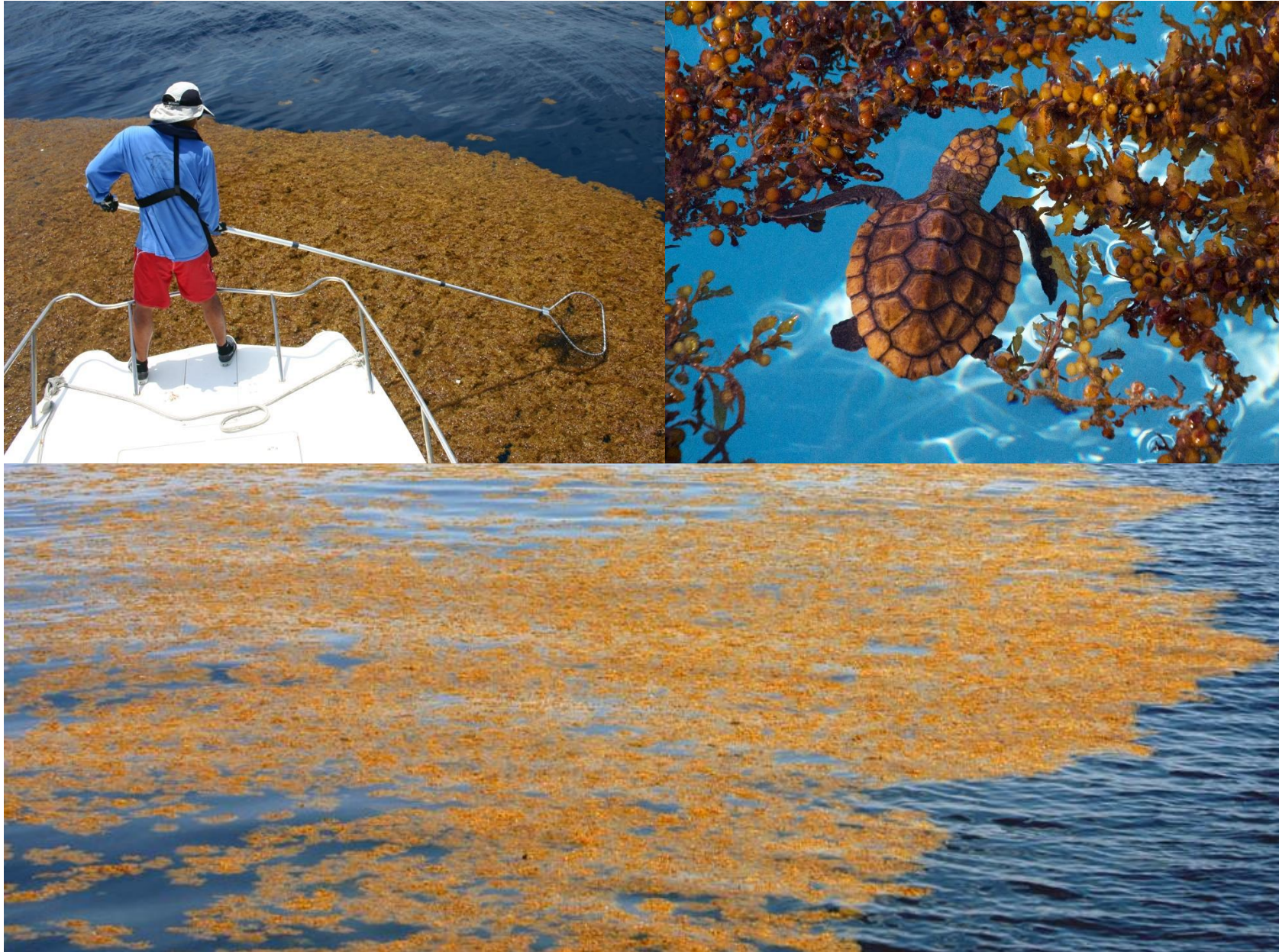
Genus: *Sargassum*



Sargassum sp.

- *Sargassum* sp. is the one of macroalgae seaweeds.
- *Sargassum* sp. is does not connect to seabed or stones, but float on surface or near surface of the sea and produce large algal blocks, and never attaching to the seafloor during their lifecycle
- Numerous species are distributed throughout the temperate and tropical oceans of the world, While most species are predominantly cold water organisms.
- The Atlantic Ocean's **Sargasso Sea** was named after the algae, as it hosts a large amount of *Sargassum* sp.





Sargassum sp. in sea

Experimental part

Material and methods:



Sargassum sp

1- Preparations of methanol extract of *Sargassum sp.*

- Leafy parts of *Sargassum sp.* were collected + Dried + powdered
- Powder was dissolved with methanol.

2- preparation of mitochondrial fraction (MTF) and microsomal fractions (MSF)

- Sheep liver
- Centrifugation



Centrifuge

3- lipids peroxidation inhibition

Evaluated by thiobarbituric acid test (TBARS)

Material and methods:

4- scavenging of hydroxyl radical

Spectrophotometer

5- DPPH assay (2,2-Diphenyl-1 picrylhydrazyl)

To measure scavenging activity of free radical.

6- determination of sheep liver GST activity

Spectrophotometer

Material and methods:

7- Antimicrobial properties of the methanol extract

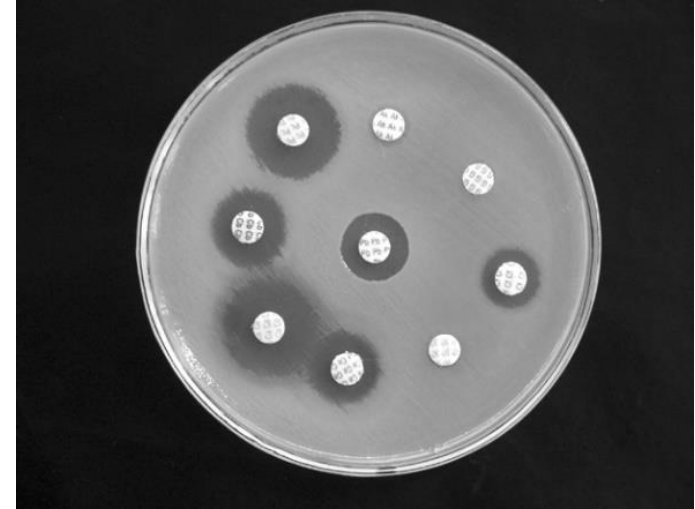
By using of disk diffusion method

Staphylococcus aureus (G+)

Escherichia coli (G-)

Bacillus subtilis (G+)

And compared with Ampicillin antibiotics



disk diffusion method

Results (antioxidant activity):

Doses/Tests	Inhibition of LPX		DPPH Assay	Hydroxyl Radical Scavenging	GST Activity
	MTF	MSF			
200 µg/ml	0*	8.0*	43.76667*	18.45333*	63.7667*
400 µg/ml	22.2*	13.0*	52.62667	33.39667*	74.433
800 µg/ml	29.0*	47.5*	68.41667*	46.14333*	79.433*
Mean	17.067	22.166	54.93667	32.664443	72.54423

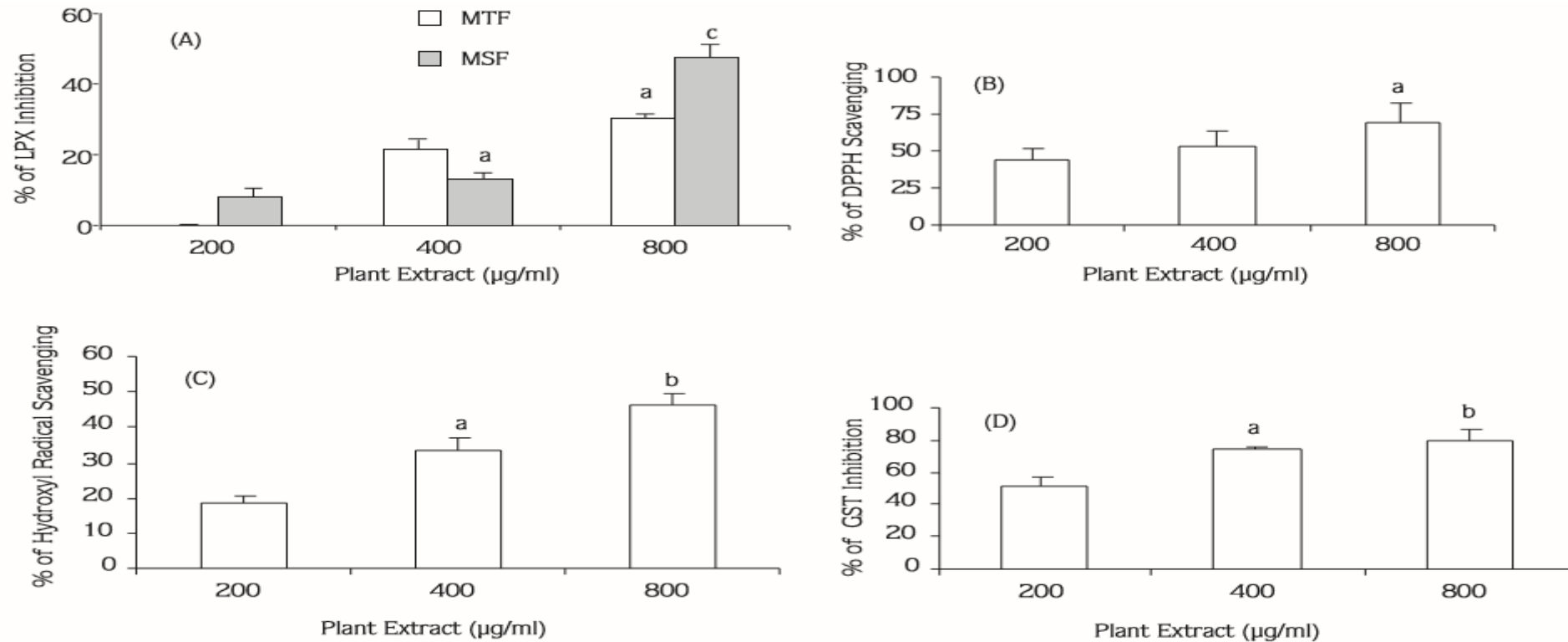


Figure 1. Effect of the methanolic extract on (A) Inhibition of lipid peroxidation (B) Scavenging of DPPH, (C) Hydroxyl radical scavenging, and (D) Inhibition of glutathione-S-transferase. Values are mean of triplicate determination \pm SD. ^aP < 0.05, ^bP < 0.01, and ^cP < 0.001.

Results (antimicrobial activity):

Table 1: antimicrobial activity of methanol extract of *Sargassum* sp.

Sl. No.	Pathogenic Strains Used	Inhibition Zone in mm		
		Ampicillin (10 µg/100 µl)	Plant Extract (2000 µg/100 µl)	Plant Extract (4000 µg/100 µl)
1	<i>Bacillus subtilis</i> (CCR-12).	23	10	18
2	<i>Escherichia coli</i> (MTCC-443).	10	09	16
3	<i>Staphylococcus aureus</i> (MTCC-96).	10	08	10

Results:

- * *Sargassum* sp. has high DPPH and OH scavenging capacity, inhibition lipid peroxidation, and percentage GST inhibition which increased with increasing concentration.
 - * Methanol extract of *Sargassum* sp. might play role in protecting cell against ROS.
 - * The results shows that the methanol extract possesses a strong antimicrobial activity against both gram-positive and gram-negative bacteria when compared with Ampicillin.
- the compound responsible for the antioxidant and antimicrobial activities are currently unclear and suggested for further work to characterize these compounds.

Conclusion:

The extract of *Sargassum* sp. could be utilized as a good natural source of antioxidants and a possible food supplement or as an antimicrobial agent in pharmaceutical industry.

Thanks for attention

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