

Preliminary study of antibacterial activity from Green and Red Seaweeds from Atacama's Coast, Chile.

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Abstract

In South America has been used algae for production of alginates (*Lessonia* sp), carragenin (*Gigartina* sp.), agar (*Gracilaria* sp.), but is very incipient the research on biomedical applications, specifically as source of new antimicrobial drugs. This work is focused in characterization of antibacterial and antimycotic properties of principal species of macroalgae from coast of Caldera, Atacama region. Algal material was collected from intermareal zone. In the lab was washed with sodium hypochlorite solution 0,2% and after rinsed several times with distilled water. After this, the material was dried by 96 hours to 45° Celsius. Once dry, the material was powdered and put into Soxhlet apparatus to obtain the extract organic (acetone/methanol 80/20) and hydroalcoholic (ethanol 80%). Once obtained the extracts was concentrated by vapor-rotatory until obtain a stock with concentration of 50mg/mL. The extracts was tested against bacterial strains of *Escherichia coli*, *Pseudomonas*, *Enterococcus faecalis* and *Staphylococcus aureus*, was considered three serial dilutions by extracts. The result was compared with antibiotic sensidiscs as positive control and pure solvents as negative control. Rhodophytas was strongly active against Gram negative strains, in contrast Chlorophyta and some rhodophyta was active against Gram positive strains. Phytochemical screening and TLC analysis was performed. Was detected flavonoids, terpenoids and alkaloids as principal compounds present in extract.

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Preliminary study of antibacterial activity from Green and Red Seaweeds from Atacama's Coast, Chile.

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In South America has been used algae for production of alginates (*Lessonia* sp), carrageenan (*Gigartina* sp.), agar (*Gracilaria* sp.), but is very incipient the research on biomedical applications, specifically as source of new antimicrobial drugs. This work is focused in characterization of antibacterial and antimycotic properties of principal species of macroalgae from coast of Caldera, Atacama region. Algal material was collected from intermareal zone. In the lab was washed with sodium hypochlorite solution 0,2% and after rinsed several times with distilled water. After this, the material was dried by 96 hours to 45° Celsius. Once dry, the material was powdered and put into Soxhlet apparatus to obtain the extract organic (acetone/methanol 80/20) and hydroalcoholic (ethanol 80%). Once obtained the extracts was concentrated by vapor-rotatory until obtain a stock with concentration of 50mg/mL. The extracts was tested against bacterial strains of *Escherichia coli*, *Pseudomonas*, *Enterococcus faecalis* and *Staphylococcus aureus*, was considered three serial dilutions by extracts. The result was compared with antibiotic sensidiscs as positive control and pure solvents as negative control. Rhodophytas was strongly active against Gram negative strains, in contrast Chlorophyta and some rhodophyta was active against Gram positive strains. Phytochemical screening and TLC analysis was performed. Was detected flavonoids, terpenoids and alkaloids as principal compounds present in extract.

Introduction

In South America has been used seaweeds for production of alginates (*Lessonia*), carrageenan (*Gigartina*), and agar (*Gracilaria*) (1). But is very incipient the work of biomedicine applications, specially as source of new drugs in Chile. Some antecedents about its potential as immunostimulator (2), and cellular proliferation substrates (3) for cell therapy. Works in Mexico and Brazil have demonstrated good activity against bacteria and fungus of organic extracts from Macroalgae (4,5). The present work try to show a preliminary study focused in determinate if Macroalgae from Atacama's coast had antimicrobial properties, primarily the antibacterial potential, as first research in this field.

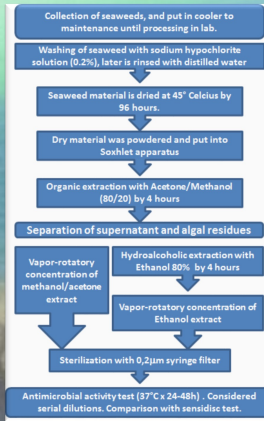


FIGURE 1: pictures that show the geographical location of collection area. Are shown the scale at national, regional and local level.



FIGURE 2: pictures show the seaweeds collected and used in this study. 1, *Chondrus crispus*; 2, *Chondrus crispus*; 3, *Gelidium coulteri*; 4, *Ulva lactuca*.

Methodology



Results

STRAIN	Inhibitory Area (mm) by Sensidisc (mm)									
	Min	5h	10h	15h	18h	20h	21h	21h	22h	22h
<i>E.coli</i> 2881	18	18	17	18	18	21	21	21	22	22
<i>Pseudomonas</i> 2783	-	19	20	-	-	12	16	-	-	-
<i>Escherichia</i> 2783	-	-	-	-	-	-	-	-	-	-
<i>Staphylococcus</i> 2812	-	-	-	-	-	-	-	-	-	-

Table 1: Results of bacterial growth inhibition test (Sensidisc). Min: Minimum; 5h: 5 hours; 10h: 10 hours; 15h: 15 hours; 18h: 18 hours; 20h: 20 hours; 21h: 21 hours; 22h: 22 hours. Results are the average of four replicates.

STRAIN	Inhibitory Area (mm) (with serial dilution)			
	1:1	1:2	1:4	1:8
<i>E.coli</i> 2881	12	12	12	12
<i>Pseudomonas</i> 2783	12	12	12	12
<i>Escherichia</i> 2783	12	12	12	12
<i>Staphylococcus</i> 2812	12	12	12	12

Table 2: Results of antibacterial activity of ethanol extract. The inhibition zones are the average of four replicates. 1:1: 1:1 dilution to 25% (25%); 1:2: 1:2 dilution to 12,5% (12,5%); 1:4: 1:4 dilution to 6,25% (6,25%); 1:8: 1:8 dilution to 3,125% (3,125%).

STRAIN	Inhibitory Area (mm) (with serial dilution)									
	1:1	1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512
<i>E.coli</i> 2881	12	12	12	12	12	12	12	12	12	12
<i>Pseudomonas</i> 2783	12	12	12	12	12	12	12	12	12	12
<i>Escherichia</i> 2783	12	12	12	12	12	12	12	12	12	12
<i>Staphylococcus</i> 2812	12	12	12	12	12	12	12	12	12	12

Table 3: Results of antibacterial activity of methanol/acetone extract. The inhibition zones are the average of four replicates. 1:1: 1:1 dilution to 25% (25%); 1:2: 1:2 dilution to 12,5% (12,5%); 1:4: 1:4 dilution to 6,25% (6,25%); 1:8: 1:8 dilution to 3,125% (3,125%); 1:16: 1:16 dilution to 1,5625% (1,5625%); 1:32: 1:32 dilution to 0,78125% (0,78125%); 1:64: 1:64 dilution to 0,390625% (0,390625%); 1:128: 1:128 dilution to 0,1953125% (0,1953125%); 1:256: 1:256 dilution to 0,09765625% (0,09765625%); 1:512: 1:512 dilution to 0,048828125% (0,048828125%).

Discussion

Preliminary of antibacterial activity against Gram negative of ethanol extracts from *Gelidium coulteri* Ulvaceae, and show activity against Gram positive but contrasted in only one of the strains studied. In contrast, the methanol/acetone extracts show a broad spectrum of antibacterial activity, as they are active against Gram positive and Gram negative, with predominance of this activity in the rhodophyta algae. In this context, TLC chromatograms of both categories extracts show considerable differences in the amount and type of compounds, coincided with greater diversity of compounds. These results are consistent with studies that show that seaweeds are especially rich in lipid compounds and / or hydrophilic with antibacterial and antiviral activity, specificity of phenolic compounds and delphinidic glycoside type (6).

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