

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. Rhodophyta 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.), 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. Rhodophyta 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 it's 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: picture 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 canaliculatus*, 2. *Chondrus canaliculatus*, 3. *Gelidium coulteri*, 4. *Gelidium coulteri*.

Methodology

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graph TD; A[Collection of seaweeds, put in cooler to maintenance until processing in lab.] --> B[Washing of seaweed with sodium hypochlorite solution (0,2%), later is rinsed with distilled water]; B --> C[Seaweed material is dried at 45° Celsius by 96 hours]; C --> D[Dry material was powdered and put into Soxhlet apparatus]; D --> E[Organic extraction with Acetone/Methanol (80/20) by 4 hours]; E --> F[Separation of supernatant and algal residues]; F --> G[Vapor-rotatory concentration of methanol/acetone extract]; F --> H[Hydroalcoholic extraction with Ethanol 80% by 4 hours]; G --> I[Vapor-rotatory concentration of Ethanol extract]; H --> I; I --> J[Sterilization with 0,2µm syringe filter]; J --> K[Antimicrobial activity test (37°C x 24-48h). Considered serial dilutions. Comparison with sensidisc test.];
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Results

STRAIN	Inhibitory Area (mm)							
	1	2	3	4	5	6	7	8
<i>E. coli</i> 2001	18	11	17	18	16	21	21	20
<i>Pseudomonas</i> sp. 1999	-	19	30	-	-	-	12	30
<i>Enterococcus</i> 4022003	-	-	-	-	-	-	-	-
<i>Staphylococcus</i> 2002	-	-	-	-	-	-	-	-

STRAIN	Inhibitory Area (mm)											
	1	2	3	4	5	6	7	8	9	10	11	12
<i>E. coli</i> 2001	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pseudomonas</i> sp. 1999	+	+	+	+	+	+	+	+	+	+	+	+
<i>Enterococcus</i> 4022003	+	+	+	+	+	+	+	+	+	+	+	+
<i>Staphylococcus</i> 2002	+	+	+	+	+	+	+	+	+	+	+	+

STRAIN	Inhibitory Area (mm)											
	1	2	3	4	5	6	7	8	9	10	11	12
<i>E. coli</i> 2001	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pseudomonas</i> sp. 1999	+	+	+	+	+	+	+	+	+	+	+	+
<i>Enterococcus</i> 4022003	+	+	+	+	+	+	+	+	+	+	+	+
<i>Staphylococcus</i> 2002	+	+	+	+	+	+	+	+	+	+	+	+

Discussion

Predominance of antibacterial activity against Gram negative of algal extracts from Chlorophyta *Ulva* species, and show activity against Gram positive but restricted to 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 fish activity in the hydroalcoholic phase. In this context, the chromatograms of both categories extracts show considerable differences in the amount and types of compounds, correlated 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 antifungal activity, specificity of phenolic compounds and derivatives phenolic type (5,6).

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