

ANTIBACTERIAL ACTIVITY OF *GRACILARIOPSIS LONGISSIMA* (RHODOPHYTA, GRACILARIALES) LIPIDIC EXTRACT

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Abstract

In this work we report the presence of an antibacterial activity in a seaweed, *Gracilariopsis longissima*, common in the Mar Piccolo of Taranto (Northern Ionian Sea, Italy). In particular, algal lipidic extract shows a bacteriostatic activity against several *Vibrio* species. Palmitic acid is predominant among the fatty acids and is presumably responsible for the antibacterial activity observed.

Keywords: Antibiotics, Algae, Bacteria, Ionian Sea

Introduction

With the advances in phytochemistry and pharmacology methods, several medicinal plants were screened for active principles and biological activities. Seaweeds are very abundant in coastal zones, where they sometimes reach high biomasses. In spite of their abundance, they are less used than terrestrial plants as source of bioactive compounds with potential biotechnological interest. Only in recent years they increasingly attracted interest in the search for new drugs and have been shown to be a primary source of bioactive natural products including antibiotics. Therefore, an effort is made in the present investigation to screen a common red alga, namely *Gracilariopsis longissima*, for its antimicrobial activity.

Materials and Methods

In summer, *Gracilariopsis longissima* (S.G. Gmelin) Steentoft, L.M. Irvine et Farnham) was collected in the Mar Piccolo of Taranto. The selected algal material was washed 3-4 times in distilled water then shade dried for 8 d, and the fully dried material was powdered. The powdered material was subjected to Soxhlet extraction using chloroform/methanol (2:1 at 55-60 °C for 24 h). The extract was concentrated to dryness in a flask evaporator under reduced pressure and controlled temperature. Five milligrams of extract were dissolved in 1 ml of ethanol and assayed for antimicrobial activity using the Kirby Bauer method [1]. *In vitro* screening was carried out using several bacterial strains. Fatty acid composition was determined as described by Budge and Parrish [3]. Analysis of fatty acid methyl esters was performed by gas-liquid chromatography using a 6890 Hewlett Packard series gas chromatograph equipped with a Omegawax 250 capillary column (Supelco - USA).

Results and Discussions

Gracilariopsis longissima lipidic extract showed a bacteriostatic activity against all the *Vibrio* species utilized (*Vibrio alginolyticus*, *Vibrio fluvialis*, *Vibrio salmonicida*, *Vibrio vulnificus* and *Vibrio cholerae* non O-1). These results are interesting considering both the resistance against antibiotics developed by bacteria [5] and the need to control fish and shellfish diseases due to bacterial infections, including vibriosis [2]. The fatty acids profile of *Gracilariopsis longissima* showed that palmitic acid methyl ester (16:0) was the predominant saturated fatty acid (42%), whilst, among monounsaturated fatty acids oleic acid methyl ester (18:1) prevailed (8.5%). Since the palmitic acid represents the main component of fatty acids it is presumably responsible of the antibacterial activity observed in the target algal species. In several studies, indeed, palmitic acid has been reported to be the major antibacterial compound in a mixture of fatty acids from other algal species. The exact mechanism by which fatty acids exert their bactericidal action remains unresolved but it has been suggested that these molecules initiate peroxidative processes and inhibit bacterial fatty acid synthesis [6]. However, fatty acids may interact with cellular membranes causing leakage of molecules from the cells, reduction of nutrient uptake or inhibition of cellular respiration [4].

Table 1. Results of *in vitro* experiments showing the antibacterial activity of *Gracilariopsis longissima* lipidic extract.

Bacterial strain	Diameter of bacterial growth inhibition (cm)
<i>Vibrio alginolyticus</i>	2.5
<i>Vibrio fluvialis</i>	0.8
<i>Vibrio salmonicida</i>	0.8
<i>Vibrio vulnificus</i>	1.5
<i>Vibrio cholerae</i> non O-1	1

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