Identification of bioactive compounds and evaluation of the antimicrobial and anti-biofilm effect of Psammocinia sp. and Hyattella sp. sponges from the Persian Gulf

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Abstract

Biofilms are microbial communities that bind to surfaces resist adverse conditions. Increasing the survival of bacteria in biofilm structures compared to their planktonic form causes problems in drug treatment. On the other hand, drug resistance in the world is increasing and the need to discover and identify new compounds with the antimicrobial effect is felt. Marine sponges are adapted to unique marine environments and can fight pathogens of these ecosystems without having a dedicated defense system. This study aimed to investigate the antimicrobial and anti-biofilm effects and also to identify the bioactive compounds of two samples of Psammocinia sp. and Hyattella sp. sponges. Six bacteria Pseudomonas aeruginosa, Acinetobacter baumannii, Klebsiella pneumonia, Escherichia coli, Staphylococcus aureus and Bacillus cereus were tested. The extract was first extracted using dichloromethane and methanol (DCM: MeOH) (1:1 v/v) solvents. The planktonic form was investigated using Disk diffusion and agar well diffusion methods. The minimum inhibitory concentration (MIC) was determined by the microdilution method and then the minimum bactericidal concentration (MBC). Gas Chromatography (GC) and Gas Chromatography-Mass Spectrometry (GC-MS) were performed to identify the compounds of each extract. No zone of inhibition (ZOI) was observed on the planktonic form of K. pneumonia due to both extracts. MIC have about 10 to 20 mg/ml and MBC in about 20 to 80 mg/ml was determined. The results showed that the effect of both extracts on the degradation of the biofilm formed by B. cereus was less than other bacteria. The results of GC-MS showed the presence of phenol, butanedioic acid, propanoic acid and Benzeneacetaldehyde compounds. This study showed that marine sponges at the Persian Gulf can be a good candidate for the extraction of bioactive compounds that use as antimicrobial agents.

Keywords: Antimicrobial; Anti-biofilm; Sponge; Bioactive compounds; Secondary metabolites; Psammocinia sp.; Hyattella sp.; Gas chromatography-mass spectrometry; GC-MS.