

Brought to you by [INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA](#)

Scopus

[Back](#)

Water quality characterisation, antibacterial activity and metabolite profiling of Malaysian tropical mangrove-derived *Actinophytocola* sp. K4-08

[Desalination and Water Treatment](#) • Article • 2023 • DOI: 10.5004/dwt.2023.30012 [Abidin, Zaima Azira Zainal](#)^a ; [Zin, Nur Huda Mohd](#)^a; [Darnis, Deny Susanti](#)^b; [Chowdhury, Ahmed Jalal Khan](#)^c ^aDepartment of Biotechnology, Kulliyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Pahang, Kuantan, 25200, Malaysia[Show all information](#)

0

Citations

[View PDF](#)[Full text](#) [Export](#) [Save to list](#)[Document](#)[Impact](#)[Cited by \(0\)](#)[References \(28\)](#)[Similar documents](#)

Abstract

Mangrove ecosystems constitute a large portion of the coastline in the tropical and subtropical regions of Earth and are characterized by their salinity and tidal variation which results in frequent anaerobic conditions and a wide range of redox potential. Such conditions make mangroves hotspots for microbial diversity, and the microbial community plays essential roles in the functioning and maintenance of the ecosystem. The complex microbial communities that inhabit the sediment of mangroves plays a crucial role in the coupling of biogeochemical cycles between the land and ocean. Hence, the objectives of this work were to characterise *Actinophytocola* sp. K4-08, to assess the antibacterial ability of the crude extracts obtained from *Actinophytocola* sp. K4-08 growth culture and to determine potential compounds present in the extract through gas chromatography-mass spectrometry (GC-MS) profiling. *Actinophytocola* sp. K4-08, a rare actinomycete was previously isolated from mangrove forest sediment in Kuantan, Pahang, Malaysia. *Actinophytocola* sp. K4-08 colonies appeared in a round-irregular shape with formation of powdery white aerial mycelia spores around the colony and dense, white-creamed substrate hyphae in the middle. Scanning electron microscopy showed a regular round spore chain with short branching. This bacterium could tolerate up to 10% sodium chloride (NaCl) and able to utilize gentiobiose, D-raffinose, α -D-glucose, D-galactose, 3-methyl glucose, D-fucose, L-fucose, inosine, D-galacturonic acid, citric acid, acetic acid and formic acid as carbon sources and resistance to minocycline and aztreonam antibiotics. PKS-I and NRPS genes, usually related to secondary metabolite ability were detected in this bacterium. Three crude extracts were prepared – methanol, ethyl acetate and acetone. Methanolic and ethyl acetate extracts exhibited strong antibacterial activity against *Bacillus subtilis* while acetone showed weak antibacterial activity. Further analysis was conducted on methanolic extract through Fourier-transform infrared spectroscopy and GC-MS. Fourier-transform infrared spectrum produced peaks at 3,327; 2,927; 1,636; 1,411 and 1,018 cm^{-1} which corresponded to O–H stretching bond in alcohol, stretching C–H in alkane group, stretching of C=C in alkene group, C–H bending in alkane group and stretching carbonyl group in primary alcohol respectively. GC-MS profiling identified 9 compounds and they were 3,4-dihydroxy-3,4-dimethylhexane-2,5-dione, 2,4-di-tert-butylphenol (2,4-DTBP), 1-docosene, hexadecanoic acid methyl ester, methyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate, 1-nonadecene, linoleic acid methyl ester, oleic acid methyl ester, and stearic acid methyl ester. Linoleic acid methyl ester, oleic acid methyl ester and hexadecanoic acid methyl ester are usually linked to antioxidant activity whereas 2,4-DTBP is secondary metabolite that is associated with many biological potentials. However,

the findings of this study indicate the promising potential of rare actinomycete *Actinophytocola* sp. K4-o8 to be developed as antibacterial agent towards the applications in the medicinal and pharmaceutical industries. © 2023 Elsevier Inc.

Author keywords

Actinophytocola sp. K4-o8; Antibacterial; Mangrove rare actinomycete; Metabolite profiling; Phenotypic characterisation

Indexed keywords

Regional Index

Kuantan; Malaysia; Pahang; West Malaysia

GEOBASE Subject Index

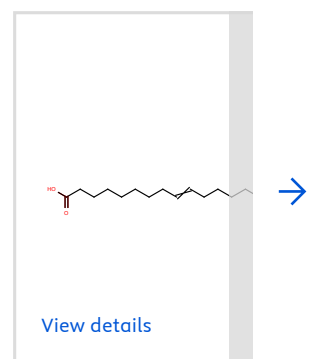
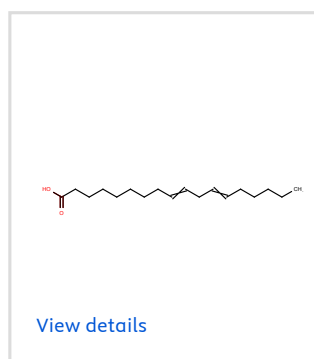
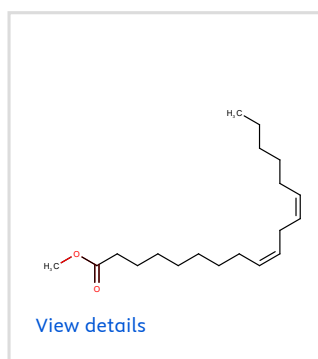
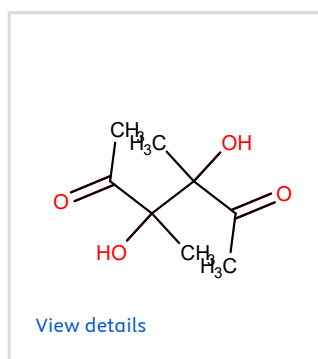
anoxic conditions; bacterium; coast; gas chromatography; mass spectrometry; metabolite; microbial community; phenotype; redox potential; salinity; water quality

Reaxys Chemistry database information

Reaxys is designed to support chemistry researchers at every stage with the ability to investigate chemistry related research topics in peer-reviewed literature, patents and substance databases. Reaxys retrieves substances, substance properties, reaction and synthesis data.

Substances

[View all substances \(5\)](#)



Powered by Reaxys

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Funding sponsor	Funding number	Acronym
Ministry of Higher Education, Malaysia See opportunities by MOHE	FRGS/1/2017/STG03/ UIAM/03/1	MOHE
Ministry of Higher Education, Malaysia See opportunities by MOHE		MOHE

Funding text

This work was supported by the Ministry of Higher Education, Malaysia under grant FRGS/1/2017/STG03/ UIAM/03/1.

Corresponding authors

Corresponding
author

Z.A.Z. Abidin

Affiliation

Department of Biotechnology, Kulliyyah of Science, International Islamic University Malaysia, Jalan Sultan
Ahmad Shah, Bandar Indera Mahkota, Pahang, Kuantan, 25200, Malaysia

Email address

zzaima@iium.edu.my

© Copyright 2024 Elsevier B.V., All rights reserved.

Abstract

Author keywords

Indexed keywords

Reaxys Chemistry database information

Funding details

Corresponding authors

About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)

[Privacy matters](#)

Language

[日本語版を表示する](#)

[查看简体中文版本](#)

[查看繁體中文版本](#)

[Просмотр версии на русском языке](#)

Customer Service

[Help](#)

[Tutorials](#)

[Contact us](#)

ELSEVIER

[Terms and conditions](#) [Privacy policy](#) [Cookies settings](#)