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

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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 utilise gentiobiose, D-raffinose, a-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. K4-08 to be developed as antibacterial agent towards the applications in the medicinal and pharmaceutical industries.

Keywords **Author Keywords:** Mangrove rare actinomycete; Actinophytocola sp. K4-08; Antibacterial; Phenotypic characterisation; Metabolite profiling
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