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Antibiotic biosynthesis pathways from endophytic streptomyces suk 48 through metabolomics and genomics approaches

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Abstract

Streptomyces sp. has been known to be a major antibiotic producer since the 1940s. As the number of cases related to resistance pathogens infection increases yearly, discovering the biosynthesis pathways of antibiotic has become important. In this study, we present the streamline of a project report summary; the genome data and metabolome data of newly isolated Streptomyces SUK 48 strain are also analyzed. The antibacterial activity of its crude extract is also determined. To obtain genome data, the genomic DNA of SUK 48 was extracted using a commercial kit (Promega) and sent for sequencing (Pac Biosciences technology platform, Menlo Park, CA, USA). The raw data were assembled and polished using Hierarchical Genome Assembly Process 4.0 (HGAP 4.0). The assembled data were structurally predicted using tRNAscan-SE and rnammer. Then, the data were analyzed using Kyoto Encyclopedia of Genes and Genomes (KEGG) database and antiSMASH analysis. Meanwhile, the metabolite profile of SUK 48 was determined using liquid chromatography-mass spectrophotometry (LC-MS) for both negative and positive modes. The results showed that the presence of kanamycin and gentamicin, as well as the other 11 antibiotics. Nevertheless, the biosynthesis pathways of aurantioclavine were also found. The cytotoxicity activity showed IC50 value was at 0.35 ± 1.35 mg/mL on the cell viability of HEK 293. In conclusion, Streptomyces sp. SUK 48 has proven to be a non-toxic antibiotic producer such as auranticlavine and gentamicin. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

Author Keywords

Bioinformatics; Biosynthesis pathways; Metabolites profiles; Non-toxic isolates; Streptomyces sp. SUK 48

Index Keywords

acetic acid ethyl ester, acetonitrile, antibiotic agent, dimethyl sulfoxide, genomic DNA, gentamicin, kanamycin, methanol, phosphate buffered saline, RNA 16S; antibacterial activity, antibiotic biosynthesis, antibiotic resistance, Article, bacterium isolation, bioinformatics, biosynthesis, cell viability, controlled study, cytotoxicity, cytotoxicity assay, diastolic blood pressure, DNA extraction, Escherichia coli, fermentation, gene expression, genomics, high performance liquid chromatography, human, human cell, IC50, LD50, liquid chromatography, liquid chromatography-mass spectrometry, mass fragmentography, mass spectrometry, metabolite, metabolome, metabolomics, MTT assay, multiple sclerosis, nonhuman, particle size, sequence homology, spectrophotometry, Streptomyces, toxicity testing, ultra performance liquid chromatography

Chemicals/CAS

acetic acid ethyl ester, 141-78-6; acetonitrile, 75-05-8; dimethyl sulfoxide, 67-68-5; gentamicin, 1392-48-9, 1403-66-3, 1405-41-0; kanamycin, 11025-66-4, 61230-38-4, 8063-07-8; methanol, 67-56-1

Tradenames

MicrOTOF Q III, Bruker, Germany; Nanodrop 2000, Thermo, United States; UltiMate 3000, Bruker, Germany

Manufacturers

Sigma Aldrich, Malaysia; Merck, United StatesBruker, Germany; Pacific Biosciences, Singapore; Addex, United States;

Omega, United States; Promega, United States; Thermo, United States

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