World Academy of Science, Engineering and Technology
International Journal of Pharmacological and Pharmaceutical Sciences
Vol:16, No:06, 2022

Revealing the Genome Based Biosynthetic Potential of a Streptomyces sp. Isolate BR123 Presenting Broad Spectrum Antimicrobial Activities

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Abstract : Actinomycetes, particularly genus Streptomyces is of great importance due to their role in the discovery of new natural products, particularly antimicrobial secondary metabolites in the medicinal science and biotechnology industry. Different Streptomyces strains were isolated from Helianthus annuus plants and tested for antibacterial and antifungal activities. The most promising five strains were chosen for further investigation, and growth conditions for antibiotic synthesis were optimised. The supernatants were extracted in different solvents, and the extracted products were analyzed using liquid chromatography-mass spectrometry (LC-MS) and biological testing. From one of the potent strains Streptomyces globusus sp. BR123, a compound lavendamycin was identified using these analytical techniques. In addition, this potent strain also produces a strong antifungal polyene compound with a quasimolecular ion of 2072. Streptomyces sp. BR123 was genome sequenced because of its promising antimicrobial potential in order to identify the gene cluster responsible for analyzed compound “lavendamycin”. The genome analysis yielded candidate genes responsible for the production of this potent compound. The genome sequence of 8.15 Mb of Streptomyces sp. isolate BR123 with a GC content of 72.63% and 8103 protein coding genes was attained. Many antimicrobial, antiparasitic, and anticancerous compounds were detected through multiple biosynthetic gene clusters predicted by in-Silico analysis. Though, the novelty of metabolites was determined through the insignificant resemblance with known biosynthetic gene clusters. The current study gives insight into the bioactive potential of Streptomyces sp. isolate BR123 with respect to the synthesis of bioactive secondary metabolites through genomic and spectrometric analysis. Moreover, the comparative genome study revealed the connection of isolate BR123 with other Streptomyces strains, which could expand the knowledge of this genus and the mechanism involved in the discovery of new antimicrobial metabolites.

Keywords : streptomyces, secondary metabolites, genome, biosynthetic gene clusters, high performance liquid chromatography, mass spectrometry
Conference Title : ICADATA 2022 : International Conference on Antimicrobial Drugs and Antimicrobial Therapy Antibiotics
Conference Location : Venice, Italy
Conference Dates : June 16-17, 2022