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Isolation and Antimicrobial Potential of *Streptomycessp.* LCC-06 from the Chennai Coast of Bay of Bengal, India

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Abstract: ***Streptomycessp. is the largest genus of Actinobacteria known for producing antibacterial, antifungal, antiparasitic and immunosuppressant drugs. In the present study, Streptomycessp. was isolated from the marine soil of Chennai, along the coasts of Bay of Bengal, India. After processing the soil sediment with calcium carbonate and heat, the suspension was inoculated in Starch casein agar medium by serial dilution method. The culture inoculate isolated from colony was identified as Streptomycessp. and named as Streptomycessp. LCC-06, where LCC represents "Loyola College Chennai". Production medium-I was found to be the best media for antibiotic production. Secondary metabolite was extracted by mixing the culture broth free of biomass with equal volume (1:1, v/v) of ethyl acetate and methanol. The extract was dried in air and scrutinized for their antimicrobial activity. Gram positive and gram negative bacteria were cultured in Mueller-Hinton agar media and fungal pathogen was grown in potato-dextrose agar medium. They showed remarkable antagonistic potential for Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa, Klepsiella pneumonia, Escherichia coli, and Candida albicans. Marine soil in Chennai, along the coasts of Bay of Bengal hosts numerous potential antibiotic producing microorganisms like Streptomycessp. LCC-06.***

Keywords: *Streptomyces* sp., isolation, antimicrobial activity, drug discovery and marine soil

1. Introduction

Actinobacteria are gram positive and filamentous bacteria known for turning out extracellular enzymes and bioactive secondary metabolite with broad spectrum of activities[1,2]. Of the 23,000 bioactive secondary metabolite reported, 42% of the compounds are from Actinobacteria[3]. Non-ribosomal polyketide synthase (NRPS) and polyketide synthase (PKS) pathways enable several secondary metaboliteproductions in Actinobacteria[4]. More than 80% of the known antibiotics isolated from them are industrially decisive[5]. Two of four new antibiotics belong to Actinobacterial strains[6]. Antibiotics isolated also depend on the culture media in which they are grown[7].

*Streptomyces*sp. is the largest genus of Actinobacteria[8]. *Streptomyces*sp.unveils antagonistic effects against human pathogens[9]. They produce two-third of the known-antibiotics and demonstrate discrete metabolic diversity[10]. But only about 100 antibiotics have been used commercially to treat human, animal, and plant diseases[11]. The current study purposes at isolating *Streptomyces* sp.along the Chennai coast of Bay of Bengal, India as they are established throughout the ocean, intertidal zones, ocean sediments and seawater[12]. In the present study, they were assessed against gram positive, gram negative and fungal pathogens.

2. Materials and Methods

Isolation of *Streptomyces*sp. LCC-06

Marine soil samples were collected along the Chennai coast of Bay of Bengal, India. Pre-treatment of soil was carried out by enrichment techniques to stimulate the growth of slow-growing bacteria. Dried soil was suspended in sterilized sea water and diluted up to 10^{-4}. The suspension was inoculated in starch-casein agar (SCA) medium for 14 days. Pure culture from colony was isolated and inoculated in SCA for 14 days. Based on culture morphology and microscopic examinations, the culture was found to be *Streptomyces*sp. and named as LCC-06, where LCC represents "Loyola College Chennai".

Extraction of Secondary metabolite

LCC-06 was inoculated in production medium-I as this media composition intensify the production of antibiotics. After 14 days, broth media free of biomass was mixed with equal concentration of ethyl acetate and methanol (1:1, v/v) for secondary metabolite extraction. The extract so obtained was air- dried and explored for their antimicrobial activity.

Antimicrobial activity

Antimicrobial activity was executed by well diffusion method. Organisms used for study, namely *Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa, Klepsiella pneumonia* and*Escherichia coli* were grown in sterilized Mueller-Hinton agar medium and *Candida albicans* was grown in potato-dextrose agar medium. The Secondary metabolite extract was dissolved in DMSO and evaluated for their aggressive activity against test pathogens with concentration extending from 25 uL to 100uL. Zone of Inhibition was measured by antibiotic zone scale. All the pathogenic strains were acquired from Microbial type cell culture (MTCC), Chandigarh, Punjab, India.

3. Result

The following results were attained by weighing the antagonistic activity of secondary metabolite extracted from *Streptomyces*sp. LCC-06.

Table 1: Antimicrobial activity of LCC -06

S. No.	*Test organism*	*Zone of inhibition per concentration (mm)*			
	Gram Positive	**25uL**	**50uL**	**75uL**	**100uL**
1.	*Staphylococcus aureus*	10	11	14	17
2.	*Bacillus subtilis*	10	12	13	15
	Gram Negative				
3.	*Pseudomonas aeruginosa*	-	11	12	13
4.	*Klepsiella pneumonia*	-	11	12	13
5.	*Escherichia coli*	10	11	13	15
	Fungi				
6.	*Candida albicans*	-	10	11	13

4. Discussion

Recent years have beheld the evolution of untold multi-drug resistant bacteria and the necessity to combat has surged relatively. In the present study, *Streptomyces*sp. LCC-06 isolated from the marine environment has revealednoteworthy results against gram positive, gram negative and fungal pathogens. The least concentration being 25uL/well controlled gram positive and gram negative bacteria. The highest concentration of 100uL/well,offered antagonistic activity against all the observed test pathogens.The MRSA, multidrug resistant bacteria of *Staphylococcus aureus* is one of the most confounding pathogen in healthcare management. The above studied secondary metabolite could be the possible solution to these microbes and also to numerous others.

5. Conclusion

Secondary metabolite extracted from *Streptomyces*sp. LCC-06was isolated from the Chennai coast of Bay of Bengal andrevealed anoutstanding antagonistic activity against human disease causing pathogenic strains.

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