PRODUCTION OF ANTIMICROBIAL AND ANTIFUNGAL METABOLITES BY STREPTOMYCES VIOLACEUSNIGER AND MEDIA OPTIMIZATION STUDIES FOR THE MAXIMUM METABOLITE PRODUCTION

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Abstract. An antibiotic producing strain Streptomyces violaceusniger was isolated from soil sample, characterized and studied for antibacterial and antifungal activity profile. Fermentation broth and cell extracts were tested against typed test organisms. The activity profiles of the intracellular and extracellular crude extracts showed that the antibiotic producing culture produces two or more compounds, one being intracellular (antifungal), other being extracellular (antibacterial). Broth extract showed activity against E.coli, Bacillus subtilis, B. cereus, Pseudomonas aeruginosa and Klebsiella pneumoniae. The cell extract showed activity against Candida albicans, Aspergillus niger, Trichoderma viridae, Fusarium moniliforme and Alternaria brassicicola. Production medium was optimized for antibiotic production.

Introduction

Natural products are the most consistently successful source for providing biologically active molecules of greater chemical/structural diversity and offer opportunities for finding novel drug lead compounds that are active against wide range of targets1. The increasing emergence of acquired resistance to antimicrobial agents on account of extensive clinical and veterinary use of antibiotics seriously threatens their effectiveness for the therapy of both nosocomial and community acquired infections. Prevalence and spread of multiple drug resistant (MDR) microbial strains in the environment/patients necessitates the search for effective new antimicrobial agents.

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Actinomycetes are major group of microorganisms involved in the production of a number of antibiotics, enzyme inhibitors and biomolecules active against different microbial targets. Various regulatory mechanisms exist in microorganisms that control the production of metabolites by fermentation. Nutritional manipulation enhances the positive regulatory mechanisms of the production strains during cultivation. Commonly used inducers such as sources of carbon, nitrogen, phosphorus, amino acids, amino acid derivatives, vitamins and feed back control influence substantially fermentative production of different metabolites. The paper reports here antimicrobial activity profile of the isolated strain of *Streptomyces violaceusniger* and optimum fermentation conditions for antibiotic production.

**Materials and Methods**

**Microorganism and growth conditions**

Producer strain was isolated from a soil sample collected from hospital surrounding. The strain was characterized at Microbial Type Culture Collection, Institute of Microbial Technology, Chandigarh, India (MTCC 4006). The strain was identified as *Streptomyces violaceusniger*. Stock cultures were maintained on M6 slants (glucose 4 g, yeast ext. powder 4 g, malt ext. powder 10 g, CaCO₃ 2 g, agar powder 2%, distilled water 1L; pH 6.8). Physiological properties of the strain were studied according to the methods of Cruick Shank.

**Fermentation and antibacterial / antifungal activity**

Seed culture was prepared by inoculating one full slant culture into 50 ml. of ‘X’ – medium (soybean meal 10 g, CaCO₃ 3 g, NaCl 3 g, MgSO₄ 0.5 g, (NH₄)₂HPO₄ 0.5 g, K₂HPO₄ 1 g, glycerol 15 ml, distilled water 1L; pH 7) and incubated on rotary shaker (180 rpm.) at 27°C for 48 hrs.

For antibiotic production, ‘X’- medium was inoculated with 5% (V/V) seed culture. Fermentation was carried out on rotary shaker (200 rpm.) at 27°C for 96 hrs. Fermented