ANTIBACTERIAL ACTIVITY FOR BIOSURFACTANT PRODUCED BY STREPTOMYCES SPP. ISOLATED FROM SOIL SAMPLES

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ABSTRACT

Objective: The goal of the present study on isolation Streptomyces from soil samples with biosurfactant activity and antibacterial activity analysis.

Methods: (25) The soil samples were taken from Hilla city. (10) It is Streptomyces spp. They were identified. (4) Streptomyces spp. having the ability to hemolysis on blood agar that has the capacity to generate biosurfactants. Streptomyces spp. 8 displayed a high degree of activity having by a blood agar inhibition zone (25 mm).

Results: Antibacterial activity was evaluated for Streptomyces spp. 8 (Staphylococcus aureus, Escherichia Coli, and Pseudomonas aeruginosa). Streptomyces spp. 8 has greatest inhibition zone against S. aureus equal to 14 mm compared 12 mm against E. coli and 8 mm for P. aeruginosa. This Streptomyces spp. 8 characteristic was tested, it showed Gnm positive with aerial mycelium grey in color on yeast malt extract agar. Negative for melanin produced on tyrosine broth medium, negative for H2S output, and pigment development, it has for the use of mannitol sucrose, glucose, and fructose as carbon source and negative for xylose.

Conclusion: Isolated Streptomyces spp. having the potential to generate biosurfactants with antibacterial activity.

Keywords: Streptomyces spp., Biosurfactant, Antibacterial activity.

INTRODUCTION

Actinomycetes are bacteria and its Gram positive with filament growth, it is aerobic and great occurring in nature [1,2]. It is able for secondary metabolite producing such as antifungal, antitumor materials, and antibiotic [2,3,4]. Streptomyces spp. with biosurfactant was isolated from Tamil Nadu, India, soil samples [5]. Biosurfactant is amphiphilic compound as secondary metabolite which produced by microorganism. The good biosurfactant features make it be replaced or added to synthetic surfactant that important for food, cosmetic, and drug industry and in environment usage [6]. It has two parts, polar moiety and a non-polar group. Hydrophilic group consists of mono, oligo, or polysaccharides, peptides or proteins and hydrophobic moiety usually contain saturated, unsaturated, and hydroxy fatty acid or fatty alcohol [7]. There are varieties set of biomolecules, which having same features as synthetic surfactant [8]. Many biosurfactant features are chemically qualified to high- and low-molecular mass compounds, glycolipids and lipopeptides, as low-molecular mass biosurfactants, rhamnolipids, and surfactin as examples and proteins and lipoproteins as high-molecular mass [9]. There are many usages for biosurfactant such as bioemulsion, washing of soil, and soil flushing [10]. The good features for microbial-derived surfactants having low toxicity and able to degrade and effective at high pH and temperature values [9]. This study was aimed to Streptomyces isolation having ability for biosurfactant production and measuring activity against test bacteria.

MATERIALS AND METHODS

Isolation and Characterization of Streptomyces spp.

Twenty-five Hilla city soil samples gathered, and Caco3 treating, oven drying (45°C for 1 h). Soil dilution plate technique was used for isolating of Streptomyces spp. Yeast malt extract agar media at pH equal to 7.2. with incubation at 30°C (10 days) [11]. Cultural characteristics for Streptomyces tested on YMD agar, include aerial mycelium, substrate mycelium color, and production of pigment. Utilization for carbon sources was made [12,11].

Method for Biosurfactant detection

Biosurfactant producing isolates ability was tested by hemolytic activity presence on blood agar plate. The human blood (5%) was added to blood agar with and blood agar base. Blood agar base was sterilized by autoclave at 121°C for 15 min. Before pouring blood was added and allow to be solid. streaking for isolates made on the blood agar and incubate at 28°C for 7 days. Clear zone was observed [13].

ACTIVITY OF BIOSURFACTANT OF STREPTOMYCES SPP. 8 AGAINST TEST PATHOGENS

Cup plate method was used for measuring antibacterial activity against Staphylococcus aureus, Escherichia Coli, and Pseudomonas aeruginosa. Plates incubated at 37°C. The inhibition zone records after 34 h [14].

RESULTS AND DISCUSSION

Isolation of Streptomyces spp.

(10) Streptomyces spp. isolate was detected from 25 soil samples. It is Gram positive, with gray aerial and yellow substrate mycelium, isolates were growth on yeast malt extract agar and the colonies were not raise on agar with earth odor. Streptomyces spp. are positive for Gram stain, filament bacteria and produce different compounds with having biologically active compounds such as hydrolytic enzymes, antibiotics, and enzyme inhibitors [15].

Detection on biosurfactant production isolates

Four isolates having ability for biosurfactant production by testing on blood agar provided by red blood cell. The isolates having red blood cell ß-hemolysis inhibition zone, Streptomyces spp. (6) having higher inhibition zone 25 nm against S. aureus (Fig. 1). This results similar to [5] results, he found that the production of biosurfactant can confirm
S. aureus

- Yellow-green
+ 
+ 
+ 

StreptomeDB: a resource for natural compounds isolated from
Gray 
+
+
+
+
+
+
+

All positive, and gray aerial mycelium on yeast malt extract agar. Negative
Streptomyces
Streptomyces
by many bacteria, yeast, and fungi [18]. The antibacterial and antitumor
activity having great usage which proved by (Table 1) [19,18].

Table 1: Antibacterial activity of Streptomyces spp. 8 against test pathogens

| Bacterial test | Inhibition zone (mm) |
|----------------|----------------------|
| S. aureus      | 14                   |
| E. coli       | 12                   |
| P. aeruginosa  | 8                    |

Table 2: Streptomyces spp. 8 features

| Streptomyces spp. | Results |
|-------------------|---------|
| Gram stain        | +       |
| Aerial mycelium   | Gray    |
| Substrate mycelium| Yellow-green |
| Production of H2S  | -       |
| Pigment production| -       |
| Melanin production| -       |
| Sugar fermentation| -       |
| Xylose            | -       |
| Mannitol          | -       |
| Sucrose           | +       |
| Glucose           | +       |
| Fructose          | +       |
|                   |         |

by testing of hemolysis on blood agar [16]. Hemolysis blood technique
is a good way for biosurfactant producing microbes testing [17].

Antibacterial activity for Streptomyces spp. 8 biosurfactant producing
Antibacterial activity for Streptomyces spp. 8 was tested (S. aureus, E. coli, and P. aeruginosa). Streptomyces spp. 8 having greatest inhibition zone against S. aureus equal to 14 mm compared 12 mm against E. coli and 8 mm against P. aeruginosa. Producing of biosurfactant can be made by many bacteria, yeast, and fungi [18]. The antibacterial and antitumor activity having great usage which proved by (Table 1) [19,18].

Streptomyces spp. 8 characteristics

Streptomyces spp. 8 characteristics were tested, it showed Gram stain positive, and gray aerial mycelium on yeast malt extract agar. Negative for melanin producing on tyrosine broth medium. All Streptomyces spp. 8 features showed in Table 2.

CONCLUSION

The identified Streptomyces spp having the ability to hemolysis blood agar that has the capacity to generate biosurfactants. Antibacterial activity was evaluated for Streptomyces spp. against (S. aureus, E. coli and P. aeruginosa). Streptomyces spp. has great inhibition zone against S. aureus equal to 14 mm compared 12 mm against E. coli and 8 mm for Pseudomonas aeruginosa.

AUTHOR’S CONTRIBUTIONS

The author declares that this entire work was done by the author named in this article.

CONFLICTS OF INTEREST

The author declares no conflicts of interest.

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Fig. 1: Biosurfactant production by Streptomyces spp. isolates

0 5 10 15 20 25
0 0 0 0 0 0 0 0
inhibition zone (mm)
Streptomyces spp. isolates

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| Mannitol          | -       |
| Sucrose           | +       |
| Glucose           | +       |
| Fructose          | +       |
|                   |         |