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Antibacterial susceptibility of mucus from freshwater Snail (*Bellamya bengalensis*) against two human pathogens

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Abstract-Freshwater edible snail *Bellamya bengalensis* has potential nutritional and medicinal importance. Snail mucus constitutes biopolymer of alternating units of sulphate and N-acetyl glucosamine, glucuronic acid. In modern society, Zootherapy constitutes an important alternative among many other known therapies practiced worldwide. In present investigation antibacterial efficacy of mucus of snail *B. bengalensis* have been studied and showed antibacterial properties and it is found in water bodies of Jharkhand, India. Ethnobiological survey revealed that it can cure several diseases such as conjunctivitis, night blindness, diarrhea, stomach disorder nervousness and giddiness etc. Strains of 2 bacterial cultures were used in this study. The susceptibility of the isolated snail mucus was assayed on Muller Hinton Agar by the disc diffusion method using varied concentration, different inhibition zone was found. The highest antibacterial activity of mucus of *B. bengalensis* against *Pseudomonas aeruginosa* was observed as 13.66±.57 mm zone of inhibition followed by *Streptococcus pneumoniae* (12.66±.57 mm). Conclusion that *B. bengalensis* mucus is a biopolymer and source of antibacterial agents that can serve as an alternative to the expensive synthetic antibacterial agents used as antibiotic treatment.

Keywords : *Bellamya bengalensis*, Antibacterial, Snail mucus, Biopolymer, Inhibition zone

INTRODUCTION

People strongly believe about the function of *B. bengalensis* which can cure several diseases such as controlling conjunctivitis, night blindness, diarrhea, stomach disorder, arthritis, joint pain, rheumatism cardiac diseases controlling blood pressure, asthma, rickets (calcium metabolism) nervousness and giddiness etc. *B. bengalensis*, the common banded pond snail of India was described by Annandale. N¹ and also by Sewell *et al.*², who studied the ecology and growth rate of snail.

According to P. Srivastava. *et. al*³ it breeds throughout year reaching its peak during April to July. Many works have been done on the reproduction and biochemical studies of some freshwater snail muscle such as *Lymnaea acuminata*. Recently Ethnomedicinal importance of *B. bengalensis* was estimated in terms of analysis of its protein and amino acid composition by Debojit. *et.al.*⁴ The secretion secreted by snails have a powerful antioxidants which protect them from an atmosphere full of oxygen radicals.

It can also enhance the proliferation and functional capability of fibroblast cell. Fibroblasts are responsible for generating all the elements of the skin matrix, including

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collagen, elastin fibres. It provides firmness, strength, suppleness and elasticity for the skin by containing water.

The bodies of snails are characterised by rich mucus which covers their surface. Apparently, the mucus may serve in preventing the moisture evaporation and it helps in smooth movements by Simkiss and Wilbur⁵. It also protects the body from mechanical injuries. Mucus has antibacterial properties against many pathogenic bacteria.

MATERIALS AND METHOD

■ Extraction of mucus:

The mucus was extracted from the snail by removing the shell with a sterile sharp end of metal rod, the mucus aseptically squeezed out from the soft body. It was collected into beaker.⁶ The extracted mucus was considered 100% concentration and was stored in the refrigerator at 4°C for antibacterial analysis.

■ Antibacterial assay:

The antibacterial activity of mucus preparation was assayed using the disc diffusion method (DDM). In this method 4mm diameter discs were cut out from Whatman no 1 filter paper and sterilized using autoclave at 121°C for 15 minutes. The sterilized disc was soaked in concentration of 100% (v/v) snail mucus.⁶ Swabs were inoculated on Muller Hinton agar plate for the isolation of bacteria, using the streak plate method. Mucus impregnated discs were thereafter, air dried and placed on the plates already seeded with 1 ml for 18 hour old broth culture at 0.5 Mc Farland Standard (1.5×10⁶cfu ml⁻¹) and disc incubated at 37°C for 24 hours. Drug ciprofloxacin used for +ve control.

RESULT AND DISCUSSION

Table 1: Antibacterial activity of different concentration of mucus (15µl/ disc & 27µl/ disc) against pathogens

Pathogens	Zone of inhibition (mm) concentration of mucus (µl)/disc	
	15	27
<i>Pseudomonas aeruginosa</i>	11.0±0.0	13.66±.57
<i>Streptococcus pneumoniae</i>	10.33±0.57	12.66±.57

Table 2: Comparison of antibacterial efficacy of snail mucus(27µl/disc) and +ve control using t-test

Pathogens	Zone of inhibition (mm)	
	Snail mucus (27µl/disc)	Positive Control(30mg/disc)
<i>Pseudomonas aeruginosa</i>	13.66±.57	15.66±.58*
<i>Streptococcus pneumoniae</i>	12.66±.57	16.66±.57***

*P<0.05 or significant at 5%, ***P<0.001 or significant at 0.1%

The highest antibacterial activity of mucus of *B.bengalensis* against *Pseudomonas aeruginosa* was observed as 13.66±.57 mm zone of inhibition followed by *Streptococcus pneumoniae* (12.66±.57 mm). Maximum inhibition zone was found in case of +ve control. Statistical analysis showed that *P. aeruginosa* and *S.aureus*, *S. pneumoniae* had lesser antibacterial efficacy than +ve control (P<0.05 and P<0.001) at 5% and 0.1% respectively. Statistical analysis also showed that mucus from *B. bengalensis* had more antibacterial efficacy in *P. aeruginosa* than *S. pneumonia* (P<0.05). This study

revealed that mucus obtained from *B. bengalensis* showed varying levels of antibacterial activity on the two test organism used (*P.aeruginosa* and *S. pneumoniae*). In table 1 the mucus also showed an increase in antibacterial activity with increase in concentration. Similar result was reported by Chellaram *et al.*⁷ in case of *Trochus radiates* gastropod, maximum antibacterial activities were reported against *S.aureus* and *E.coli*. Lawrence B *et al.* also reported that snail mucus contained antibacterial properties obtained from *Archachatina marginata saturalis*, *Archachatina marginata ovum* and *Achatina. fulica*. Result revealed that

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Staphylococcus sp was more susceptible to mucus secretion from *A. marginata* (17.4±1.20mm), which corroborate the present finding in case of *B. bengalensis* but in case of *A. marginata* ovum inhibition zone was (15.6±1.44mm) and in *A. fulica* (15.4±2.04mm) indicating that in these cases the antibacterial efficacy is nearly same as *B. bengalensis*. According to Anand P. T. *et al.*⁸, ethanol extract of gastropods, *B. spirata* and *Turobo brunneus* also showed antibacterial activity against *K. pneumoniae*, *P. vulgare's* and *S.typhi*.

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