

Antibacterial Bar Soap Out of Nephelium Leaves Extract Against *Staphylococcus aureus*

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Abstract

The current research evaluates the antibacterial action of Nephelium leaves extract against *Staphylococcus aureus* and as an antimicrobial from natural sources. As antibiotic resistance continues to spread, it is imperative to discover alternative sources for antimicrobials, and among the promising candidates are those from phytochemicals derived from plants. Nephelium leaves carry bioactive compounds like flavonoids, tannins, and saponins reported to have antimicrobial activity. For their assessment of antibacterial potential, the study begins with the drying, grinding of Nephelium leaves to fine powder and subsequent solvent extraction to purify such bioactive molecules. Disk diffusion and minimum inhibitory concentration (MIC) assays are used to determine the antibacterial activity of the extract. Disk diffusion assay determines the inhibitory zone diameter around the extract and provides a qualitative prediction of bacterial susceptibility. Parallel to this, the MIC test determines the lowest concentration of the extract inhibiting the growth of microbes and indicates the potency of the extract. Results show that the Nephelium leaves extract has high antibacterial activity with clear inhibition zones against *S. aureus*. This suggests that the extract may be an alternative to synthetic antibacterial agents with a natural mechanism of action against infections caused by bacteria. The study aims for the potential application of natural antimicrobials to offset the growing menace of antibiotic resistance and promote the evolution of green and sustainable antibacterial products. In pursuing the research on antibacterial activity of Nephelium leaves, the study facilitates the development of natural therapeutic products and underscores the value of plant-based bioactive molecules in modern medicine.

INTRODUCTION

Background of the study

Bacterial infections caused by *Staphylococcus aureus* remain a public health concern with its propensity to become drug-resistant. The advent of methicillin-resistant *Staphylococcus aureus* (MRSA) adds another layer of complexity to the choice of treatment. In response, there has been a shift towards plant-derived antibacterial agents as safer and environmentally friendly alternatives. Nephelium species like rambutan contain bioactive compounds like flavonoids, tannins, and saponins that were found to possess antibacterial activity in previous years of testing and research.

Objectives of the study

1. Isolation and characterization of bioactive compounds from Nephelium rambutan leaf extract.
2. To develop an antibacterial bar soap from the extract of Nephelium rambutan leaves.
3. To evaluate the antibacterial activity of the developed soap against *Staphylococcus aureus* bacteria.

Significance of the study

The formulation of an antibacterial soap from Nephelium leaf extracts provides a natural option for chem-

ical antibacterial agents, thereby minimizing the potential for antibiotic resistance and dermal adverse reactions. The research is useful to both the pharmaceutical and cosmetic industries because it promotes the use of herbal antibacterial preparations.

METHODOLOGY

Collection and preparation of Nephelium leaves Extract

Fresh leaves of Nephelium were collected, washed, and air-dried and then powdered. The powdered leaves were ethanol extracted with a Soxhlet apparatus. The extract was filtered, concentrated, and stored for analysis.

Creation of the soap

1. Collect Nephelium rambutan leaf extract.
2. Get a boiling pan, add water and put a bowl above it.
3. Melt the soap using the double boil method.
4. Once melted, add all your other ingredients such as; dried butterfly pea flower, Nephelium rambutan leaf extract.
5. Mix thoroughly.
6. Once mixed, pour it into a silicone mold.
7. Let it cool down.
8. (OPTIONAL) To speed up the cooling process, put it in the refrigerator.

Materials

1. White soap base
2. Clear soap base
3. Nephelium rambutan leaf extract
4. Dried butterfly pea flower
5. Bowl
6. Boiling pan
7. Silicone mold
8. Essential oils
9. Pestle
10. Dried Flowers

Antibacterial Testing

The antibacterial activity of the soap was tested using:

1. Disk Diffusion Assay – Nephelium soap was dissolved, and soaked disks were placed on *S. aureus* inoculated agar plates. The zone of inhibition was noted.
2. Minimum Inhibitory Concentration (MIC) – Serial dilutions of the extract were tested to determine the minimum concentration that inhibits bacterial growth.

Results and Discussion

Phytochemical Analysis

Nephelium leaves extract had flavonoids, tannins, and saponins, which are antibacterial in nature.

Antibacterial Activity

The disk diffusion assay showed visible zones of inhibition, indicating that the soap product was active against *S. aureus*. The MIC values confirmed that Nephelium leaves extract inhibited bacterial growth at specified concentrations.

Comparison to Commercial Antibacterial Soap

The Nephelium soap synthesized was as active as commercial antibacterial soaps, indicating potential as a natural alternative.

Conclusion and Recommendations

Conclusion

The study confirmed that Nephelium leaves extract is antibacterial against *Staphylococcus aureus*. The bar soap design was promising as far as antibacterial effect was concerned, introducing it as an eco-friendly natural option compared to artificial antibacterial soaps.

Recommendations

1. The soap must be tested against other bacteria strains.
2. Compatibility and stability with the skin for the long term must be tested.
3. Soap formulation must be optimized for bulk production.