A Comparative Analysis of the Secondary Metabolites and Antibacterial Properties of Medicinal Plants available in Dhaka City, Bangladesh

Shakib Ahmed[1], Samira Latif[1], Sabbir Rahman Shuvo[1],Ishrat Jabeen[1*]
[1]Department of Biochemistry & Microbiology, North South University, Dhaka, Bangladesh.
Email Address: shakib.ahmed.2315402@northsouth.edu

Introduction

- Medicinal Plants have been used for centuries to treat various ailments. It is a great source of bioactive compounds like secondary metabolites [1].
- Considering the threat of antibiotic resistance, scientists are escalating research into the therapeutic use of medicinal plants.
- This study highlights the potential of using medicinal plants like aloe vera mint leaf to mark the threat of antibiotic resistance.

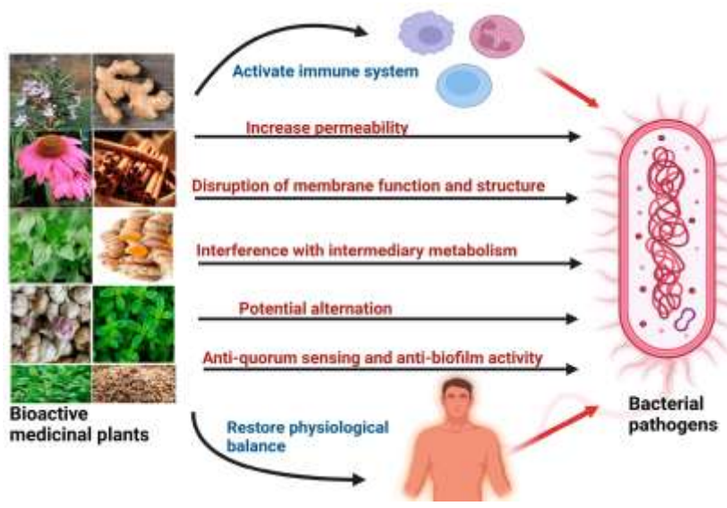


Figure 1: Mechanism of action of bioactive medicinal plants against bacterial pathogens.

Objectives

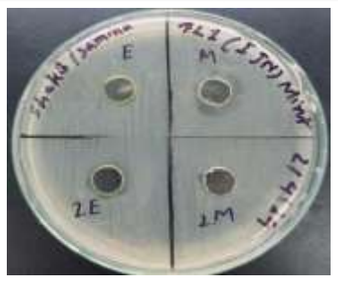
- Identification of plant secondary metabolites such as flavonoids, tannins, saponins & carotenoids isolated from medicinal plants, followed by Polymerase Chain Reaction (PCR) to investigate the presence of *CHS, SQS, LAR & PSY* genes.
- Assessment of the antibacterial potency of such phytochemicals using agar well diffusion and Minimum inhibitory concentration (MIC).

Methods

Preparation of ethanolic & methanolic extract of aloe vera and mint.

Identification of secondary metabolites.

Performing PCR of targeted genes.



Performing agar well diffusion for antibacterial profiling.

Performing MIC for antibacterial profiling.

Results

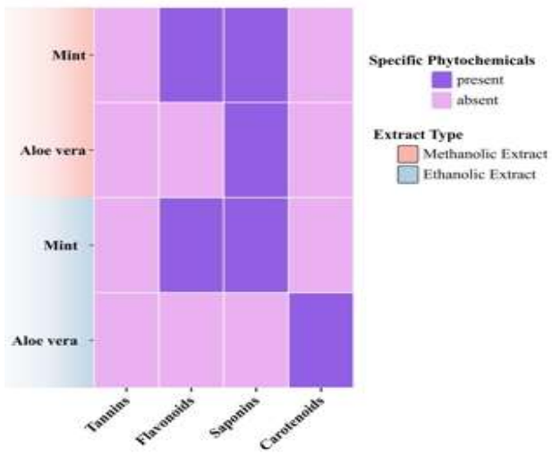
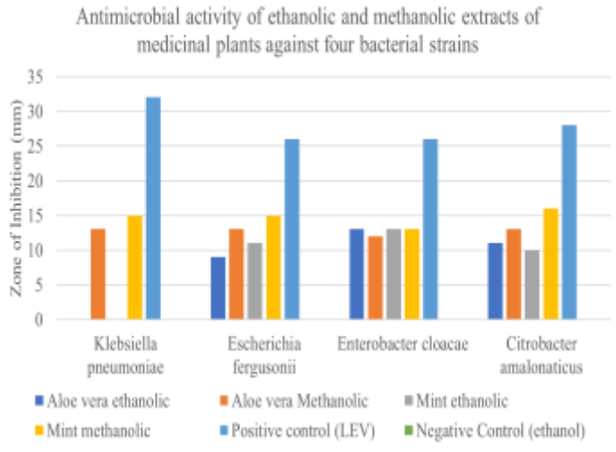


Figure 2: Secondary metabolites analysis of selected medicinal plants.



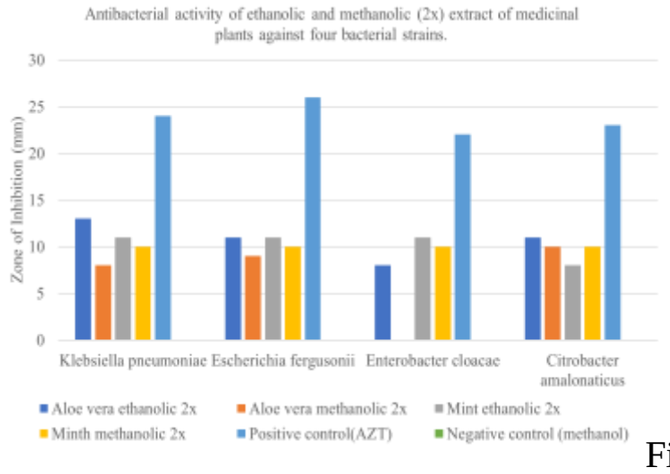


Figure 3: Antibacterial activity of medicinal plant extracts(1X & 2X ethanol &methanol) against *Klebsiella pneumoniae, Escherichia fergusonii, Enterobacter cloacae & Citrobacter amalonaticus.*

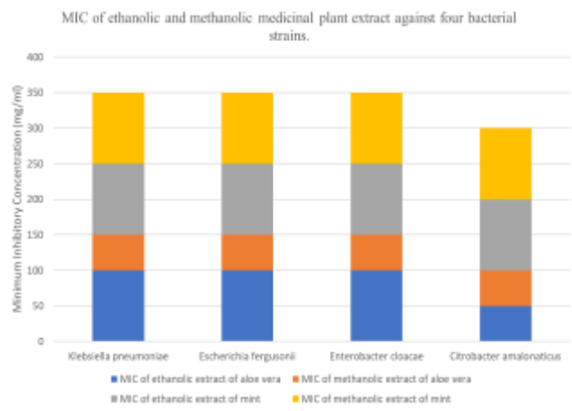


Figure 4: Minimum inhibitory concentration of medicinal plant extracts against *Klebsiella pneumoniae, Escherichia fergusonii, Enterobacter cloacae & Citrobacter amalonaticus.*

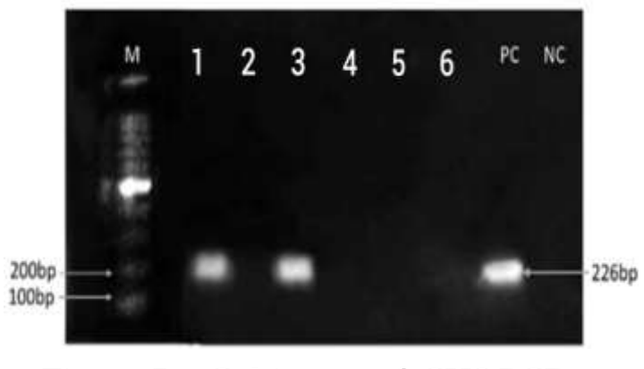


Figure 5a: Gel image of *CHS* PCR product.

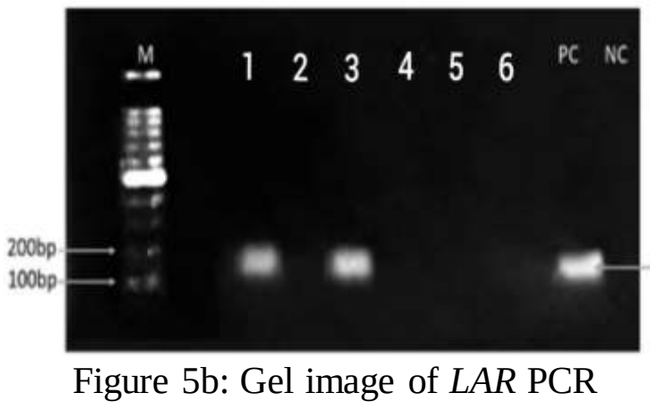


Figure 5b: Gel image of *LAR* PCR product.

Figure 5c: Gel image of *SQS* PCR product

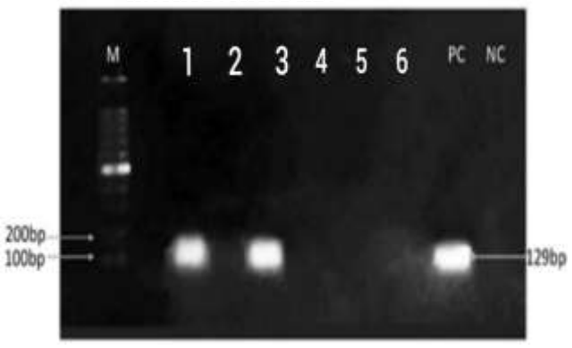


Figure 5d: Gel image of *PSY* PCR product

M= Marker, 1= Aloe vera 1, 2= Aloe vera 2, 3= Aloe vera 3, 4= Mint 1, 5= Mint 2, 6= Mint 3

Key Findings

- ❖ Both extracts showed consistent phenotypic results. None of the samples contains all four tested secondary metabolites.
- ❖ Methanolic extracts showed higher antibacterial activity than ethanolic extracts. Mint leaf was found to have a higher antibacterial potency compared to aloe vera.
- ❖ Aloe vera showed positive results in genotypic analysis, containing all four secondary metabolites. Mint doesn't contain any of the targeted genes in this study.

Conclusion/Future Work

- ➢ The findings of this study are mixed. Some irreproducible results were found in genotypic and phenotypic comparisons. However, the presence of secondary metabolites addresses their therapeutic potential.
- ➢ Research can be conducted using a larger number of samples to identify underlying mechanisms.

Acknowledgement

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References

1. Twaij, B.M. and Hasan, Md.N. (2022) 'Bioactive secondary metabolites from plant sources: Types, synthesis, and their therapeutic uses', *International Journal of Plant Biology,* 13(1), pp. 4–14.