

Exploring the Impact of *Chlorella vulgaris* Extract as an Antibacterial for Acne

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INTRODUCTION

Acne vulgaris is an inflammation of the pilosebaceous glands characterized by comedones, papules, pustules, nodules, and cysts.

Sebaceous glands



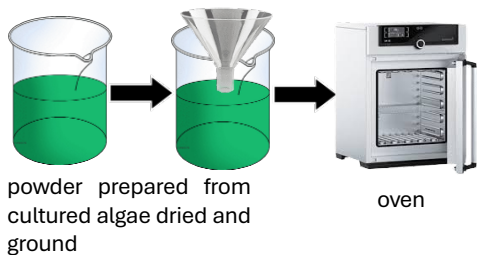
It affects about 9.4% of the global population with a prevalence of 40-80% in Southeast Asia and up to 85% among Indonesian teenagers. Although not fatal, acne can reduce self-confidence and affect mental well being.

OBJECTIVE

1. To determine the antibacterial activity of *Chlorella vulgaris* ethanol extract against *Staphylococcus aureus*.
2. To determine the antibacterial activity of *Chlorella vulgaris* ethanol extract against *Staphylococcus epidermidis*.

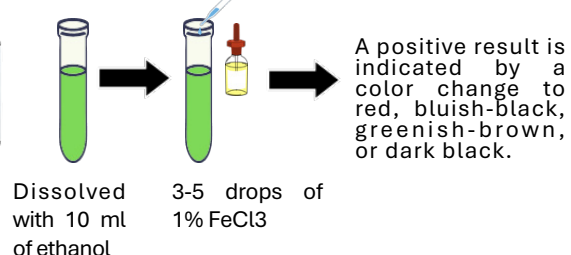
METHODOLOGY

Simplisia Preparation

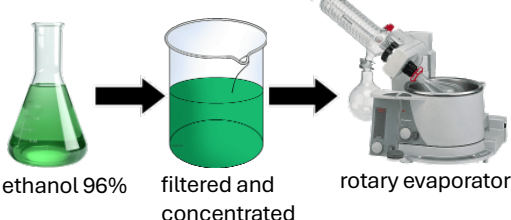


Phytochemical screening

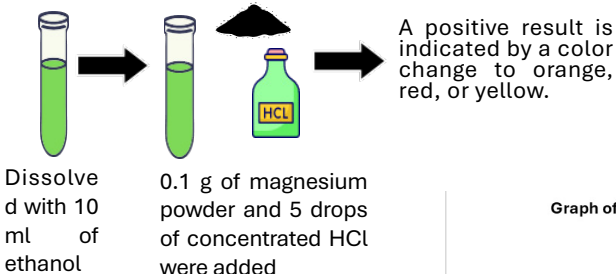
Phenolic test



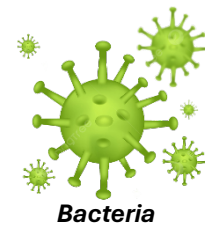
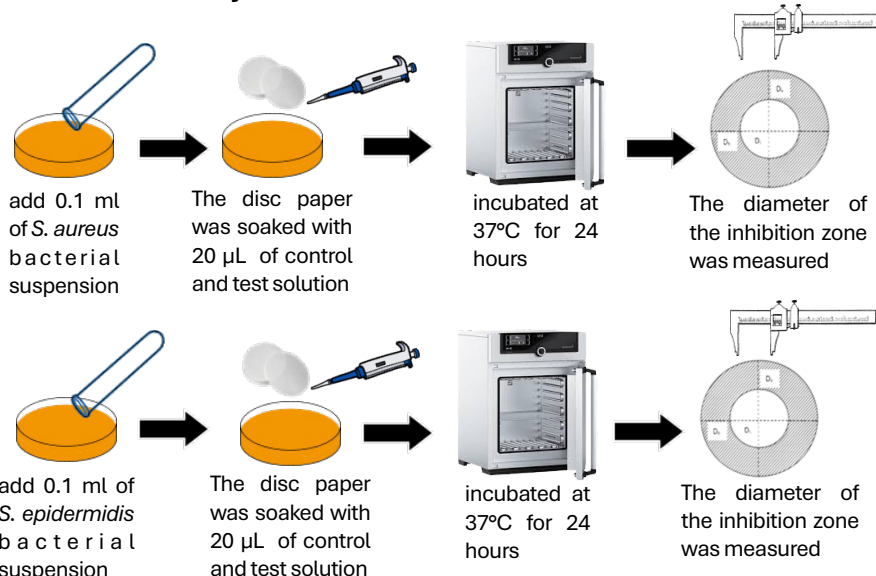
Extraction



Flavonoid test



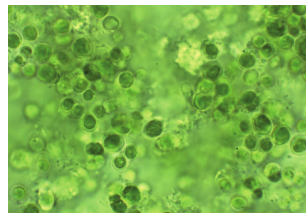
Antibacterial Activity Test



The main bacterial causes include *Propionibacterium acnes*, *Staphylococcus aureus*, and *Staphylococcus epidermidis*. The widespread use of topical antibiotics such as erythromycin and clindamycin has led to increased bacterial resistance emphasizing the need for safer alternatives.

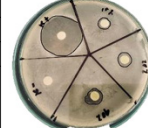
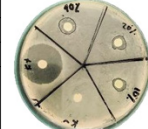
Chlorella vulgaris, a microalgae containing bioactive compounds such as flavonoids and phenolics, has been reported to exhibit antibacterial activity against several pathogenic bacteria.

This study uses 96% ethanol extract of *Chlorella vulgaris* to evaluates its potential in inhibiting the growth of *S. aureus* and *S. epidermidis* the main bacteria responsible for acne



Antibacterial Activity Test

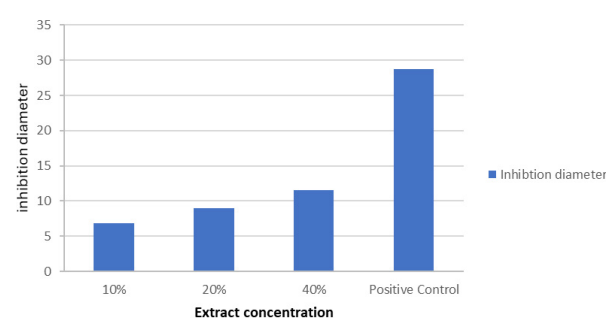
The ethanolic astract of *Chlorella vulgaris* shows inhibitory activity against *S. aureus* and *S. epidermidis*, indicated by clear inhibition zones around the paper discs.

Bacteria	Extract Concentration	Inhibition Zone (mm)	Category	Result
<i>S. aureus</i>	10%	6.84	Currently	
	20%	9.01	Strong	
	40%	11.57	Strong	
	Positive control	28.73	Very strong	
<i>S. aureus</i>	10%	7.43	Currently	
	20%	8.79	Strong	
	40%	11.38	Strong	
	Positive control	28.08	Very strong	

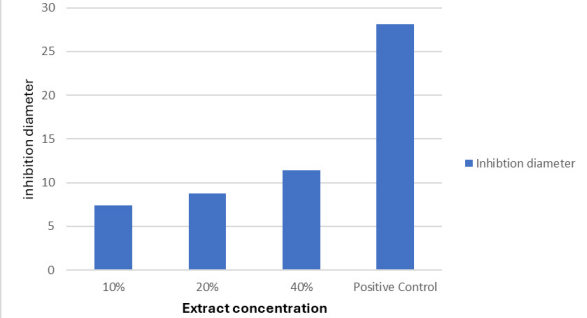
- Antibacterial activity increases with higher extract concentrations.
- The 10% and 20% concentrations have similar antibacterial effects, as do the 20% and 40% concentrations.

- The antibacterial activity is higher compared to previous studies using methanol, indicating that ethanol extracts bioactive compounds more effectively.
- This is due to the presence of flavonoids, which inhibit nucleic acid synthesis and disrupt cell membranes, and phenolic compounds, which damage bacterial cell walls.

Graph of Extract Concentration vs Inhibition Diameter (*S. aureus* Bacteria)



Graph of Extract Concentration vs Inhibition Diameter (*S. epidermidis* Bacteria)



At low concentrations, the inhibitory power against *S. aureus* and *S. epidermidis* is still small because the active compound content is not enough to inhibit bacterial growth. As the concentration increases, antibacterial activity increases because compounds such as flavonoids and phenolics work more effectively to damage cell walls and disrupt bacterial metabolism. This pattern indicates a "dose-response relationship" where antibacterial effectiveness depends on the amount of active compound, but the increase in effect can slow down at a certain point due to saturation or limited diffusion in the medium.

RESULTS

Phytochemical screening

The phytochemical screening was conducted to indentify secondary metabolits. The ethanolic extract of *Chlorella vulgaris* showed positive results for flavonoid and phenolics based on characteristic color changes.

Compounds	Before	After	Interpretation
Flavonoids			Positive for containing flavonoids
Phenolic			Positive for containing phenolics

CONCLUSION

Ethanol extract of *Chlorella vulgaris* exhibits antibacterial activity against *S. aureus* and *S. epidermidis*, increasing with concentration, with 10-20% showing moderate effects and 40% showing strong effects.

ACKNOWLEDGMENTS

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