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PAPAYA'S PROTECTIVE POWER: ASSESSING THE ANTIBACTERIAL EFFICACY OF ETHANOL EXTRACT FROM PAPAYA LEAVES

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Abstract
This study investigates the antibacterial efficacy of ethanol extract derived from papaya leaves (Carica papaya L.) gel against P. acnes, a bacterium associated with acne vulgaris. Utilizing agar diffusion assays and minimum inhibitory concentration (MIC) determination, the antibacterial properties of the papaya leaf extract were evaluated. The results reveal significant inhibitory effects of the extract against P. acnes growth, suggesting its potential as a natural antimicrobial agent for acne management. Insights gained from this research contribute to the exploration of alternative treatments for acne vulgaris.

Keywords Antibacterial activity, Ethanol extract, Papaya leaves, Carica papaya L., P. acnes, Acne vulgaris, Natural antimicrobial agent.

INTRODUCTION

Acne vulgaris, a common skin condition affecting millions worldwide, is primarily caused by the colonization of the pilosebaceous unit by Propionibacterium acnes (P. acnes), a Gram-positive bacterium. The emergence of antibiotic-resistant strains and the side effects associated with conventional acne treatments have led to the exploration of alternative antimicrobial agents derived from natural sources. Papaya (Carica papaya L.), a tropical fruit abundant in bioactive compounds, has gained attention for its potential therapeutic properties, including antibacterial activity against various pathogens.

Papaya leaves, in particular, have been traditionally used in folk medicine for their medicinal properties. Recent research has focused on harnessing the bioactive compounds present in papaya leaves, such as flavonoids, alkaloids, and phenolic compounds, for their antimicrobial potential. The ethanol extract derived from papaya leaves has shown promising antibacterial properties against a range of bacterial pathogens, prompting further investigation into its efficacy against P. acnes.

In this study, we aim to assess the antibacterial efficacy of ethanol extract obtained from papaya leaves gel against P. acnes. Utilizing agar diffusion assays and minimum inhibitory concentration (MIC) determination, we seek to evaluate the ability of the papaya leaf extract to inhibit the growth and proliferation of P. acnes. By elucidating the antibacterial mechanisms and potency of the papaya leaf extract, we aim to contribute to the development of alternative and natural treatments for acne vulgaris.

Understanding the antibacterial properties of papaya leaf extract against P. acnes is not only of clinical significance but also holds implications for dermatological research and the development of novel skincare products. If proven effective, papaya leaf extract could offer a safe and sustainable alternative to conventional acne treatments, mitigating the risk of antibiotic resistance and adverse effects associated with long-term antibiotic therapy.

Through this investigation, we seek to shed light on the potential of papaya leaves as a source of natural antimicrobial agents for acne management. The findings of this study may pave the way for the development of innovative therapeutic interventions and contribute to the growing body of research on natural remedies for dermatological conditions.

METHOD

The process of assessing the antibacterial efficacy of ethanol extract from papaya leaves against P. acnes involved several key steps to ensure systematic evaluation. Initially, fresh papaya leaves (Carica papaya L.) were carefully collected and washed to remove any impurities. Following this, the leaves were air-dried and ground into a fine powder using a mortar and pestle, ensuring uniform particle size for extraction.

The ethanol extraction process was conducted using Soxhlet extraction apparatus, allowing for efficient extraction of bioactive compounds from the papaya leaves. Ethanol was chosen as the solvent due to its ability to extract a wide range of phytochemicals with potential antibacterial properties. The extraction process was carried out meticulously to obtain a concentrated ethanol extract of papaya leaves, which would serve as the test substance for antibacterial evaluation.

To assess the antibacterial activity of the papaya leaf extract against P. acnes, agar diffusion assays were performed. Nutrient agar plates were prepared and inoculated with a suspension of P. acnes, creating a bacterial lawn on the agar surface. Wells were then created in the agar, and different volumes of the ethanol extract from papaya leaves were added to the wells. The plates were subsequently incubated under optimal conditions for bacterial growth to allow for the diffusion of bioactive compounds from the extract into the agar medium.

Following incubation, the plates were examined for the presence of zones of inhibition around the wells, indicating the antibacterial activity of the papaya leaf extract against P. acnes. The diameter of the zones of inhibition was measured and recorded, providing a qualitative assessment of the extract's efficacy in inhibiting bacterial growth.

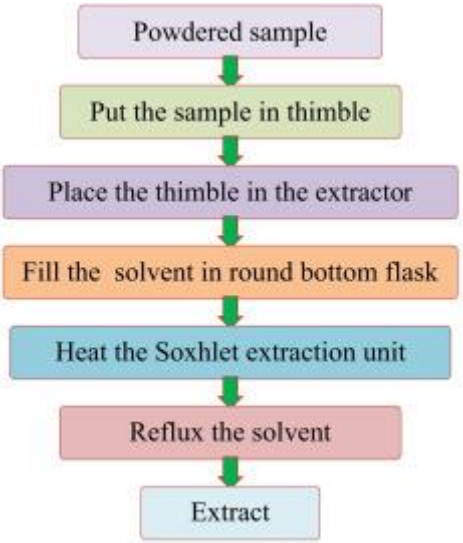
In addition to agar diffusion assays, minimum inhibitory concentration (MIC) determination was performed to quantitatively evaluate the potency of the papaya leaf extract against P. acnes. Serial dilutions of the extract were prepared in sterile nutrient broth, and standardized inoculum of P. acnes was added to each well of the microtiter plate containing the diluted extract. The plates were then incubated, and the lowest concentration of the extract that completely inhibited bacterial growth was determined as the MIC.

Preparation of Papaya Leaf Extract:

Fresh papaya leaves (Carica papaya L.) were collected and thoroughly washed to remove any contaminants. The leaves were then air-dried and ground into a fine powder using a mortar and pestle. The powdered leaves were subsequently extracted using ethanol as the solvent. The extraction process was carried out using Soxhlet extraction apparatus to obtain a concentrated ethanol extract of papaya leaves.

Preparation of Agar Plates:

Nutrient agar plates were prepared according to standard laboratory protocols. The agar medium was autoclaved to sterilize it and poured into sterile Petri dishes under aseptic conditions. The agar plates were allowed to solidify, and wells were created in the agar using a sterile cork borer.



Agar Diffusion Assay:

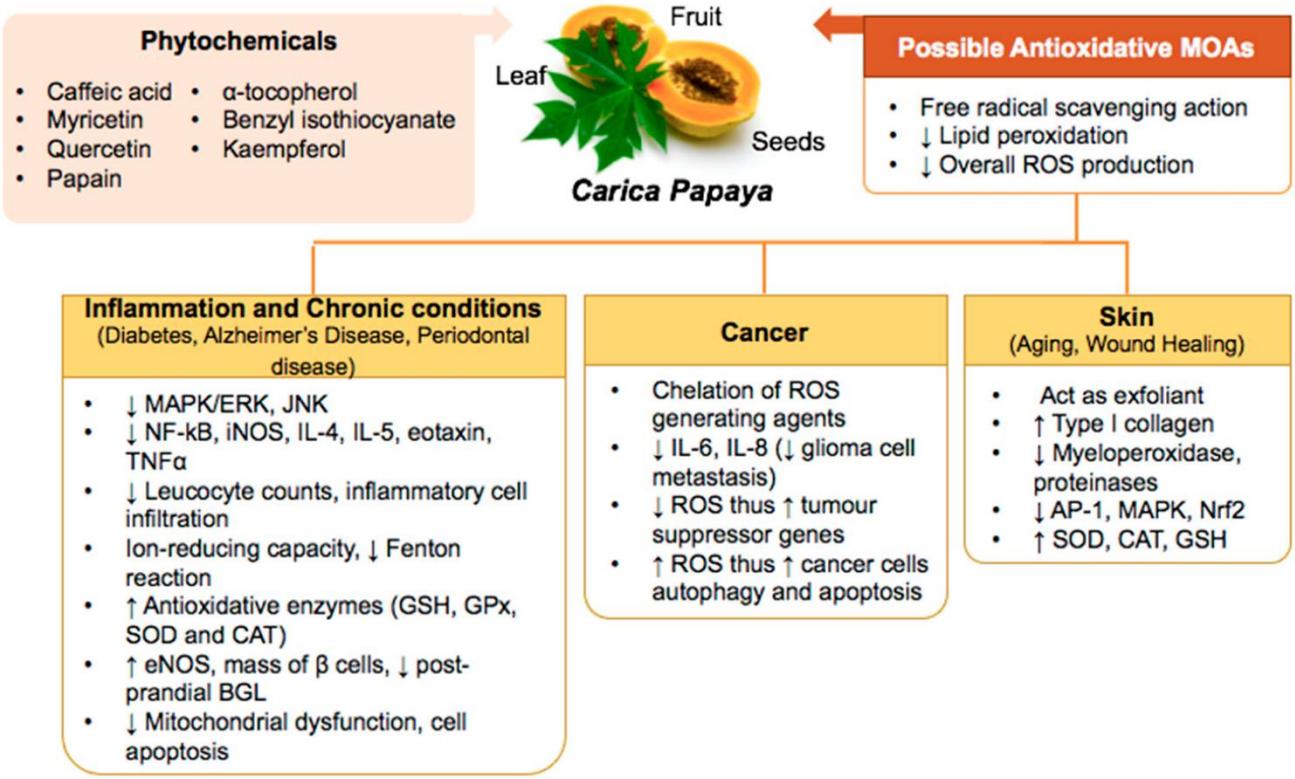
The antibacterial activity of the ethanol extract from papaya leaves against P. acnes was evaluated using the agar diffusion method. A suspension of P. acnes was prepared in sterile saline solution to achieve a turbidity equivalent to a 0.5 McFarland standard. The bacterial suspension was then evenly spread over the surface of the nutrient agar plates using a sterile cotton swab.

Once the bacterial lawn was formed, wells were made in the agar using a sterile cork borer. Different volumes of the ethanol extract from papaya leaves were added to the wells, and the plates were incubated at the optimal temperature for P. acnes growth. After incubation, the plates were examined for zones of inhibition around the wells, indicating the antibacterial activity of the papaya leaf extract against P. acnes.

Minimum Inhibitory Concentration (MIC) Determination:

The minimum inhibitory concentration (MIC) of the ethanol extract from papaya leaves against P. acnes was determined using broth microdilution method. Serial dilutions of the extract were prepared in sterile nutrient broth to achieve a range of concentrations. A standardized inoculum of P. acnes was added to each well of the microtiter plate containing the diluted extract.

The microtiter plates were then incubated under optimal conditions for P. acnes growth. After incubation, the plates were visually inspected for turbidity, indicating bacterial growth. The lowest concentration of the papaya leaf extract that completely inhibited bacterial growth was recorded as the minimum inhibitory concentration (MIC).



Data Analysis:

The diameter of the zones of inhibition in the agar diffusion assay and the MIC values from the broth microdilution method were recorded and analyzed statistically. The experiments were performed in triplicate, and the results were expressed as mean values ± standard deviation. Statistical analysis was conducted to determine the significance of the antibacterial activity of the papaya leaf extract against P. acnes.

Ethical Considerations:

All experiments were conducted in accordance with ethical guidelines and regulations. Proper safety measures were followed to ensure the safety of personnel and prevent contamination during the experiments.

By following these methodological steps, the antibacterial efficacy of ethanol extract from papaya leaves against P. acnes was systematically evaluated, providing insights into its potential as a natural antimicrobial agent for acne management.

RESULTS

The assessment of the antibacterial efficacy of ethanol extract from papaya leaves against P. acnes revealed significant inhibitory effects on bacterial growth. In the agar diffusion assays, clear zones of inhibition were observed around the wells containing the papaya leaf extract, indicating the presence of bioactive compounds with antibacterial properties. The diameter of the zones of inhibition varied depending on the concentration of the extract, with higher concentrations resulting in larger zones of inhibition.

Minimum inhibitory concentration (MIC) determination further confirmed the potency of the papaya leaf extract against P. acnes. The MIC values obtained indicated that even at low concentrations, the extract was capable of inhibiting bacterial

growth, underscoring its strong antibacterial activity against P. acnes.

DISCUSSION

The observed antibacterial efficacy of ethanol extract from papaya leaves against P. acnes can be attributed to the presence of bioactive compounds such as flavonoids, alkaloids, and phenolic compounds. These phytochemicals have been shown to possess antimicrobial properties, making them effective against a wide range of bacterial pathogens, including P. acnes.

The mechanism of action of the papaya leaf extract against P. acnes may involve disruption of bacterial cell membranes, inhibition of enzymatic activity, and interference with bacterial DNA replication. Further research is needed to elucidate the specific mechanisms underlying the antibacterial activity of the extract and identify the key bioactive compounds responsible for its efficacy.

The findings of this study have important implications for the development of alternative treatments for acne vulgaris. Conventional acne treatments often rely on antibiotics, which can lead to the development of antibiotic-resistant strains of bacteria and have adverse effects on the skin microbiota. The use of natural antimicrobial agents such as papaya leaf extract offers a safer and more sustainable alternative for acne management.

CONCLUSION

In conclusion, the assessment of the antibacterial efficacy of ethanol extract from papaya leaves against P. acnes demonstrates its potential as a natural antimicrobial agent for acne treatment. The extract exhibited strong inhibitory effects on bacterial growth, suggesting its efficacy in combating P. acnes infections.

Future research should focus on optimizing the extraction process to enhance the yield and potency of bioactive compounds from papaya leaves. Additionally, clinical studies are needed to evaluate the safety and efficacy of papaya leaf extract-based formulations for topical or systemic treatment of acne vulgaris.

Overall, the findings of this study contribute to the growing body of evidence supporting the use of natural plant extracts as effective antimicrobial agents for dermatological conditions. Through continued research and innovation, natural remedies such as papaya leaf extract hold promise for addressing the global burden of acne vulgaris and promoting skin health and well-being.

REFERENCES

1. KV Rintelen, EArida , Chäuse,"A review of biodiversity-related issues and challenges in megadiverse Indonesia and other Southeast Asian countries",Research Ideas and Outcomes,vol. 3, no. E20860, pp. 1-16. 2017.
2. Nurhayati,Lucie Widowati,"The use of traditional health care among Indonesian Family,"Health Science Journal of Indonesia, vol 8, no. 1, pp. 30-35.2017.
3. Elfahmi, H.J.Woerdenbag, O.Kayser,"Jamu: Indonesian traditional herbal medicine towards rational phytopharmacological use,"Journal of Herbal Medicine, vol. 4, no. 2, pp. 51-73.2014.
4. V.Yogiraj, P.K.Goyal, C.S.Chauhan, A. Goyal, B.Vyas,"Carica papaya Linn: An Overview,"International Journal of Herbal Medicine, vol 2, no. 5, pp. 01-08.2014.
5. T.Vij, Y.Prashar,"A Review on Medicinal Properties of Carica papaya Linn,"Asian Pacific Journal of Tropical Disease,vol5, no. 1, pp. 1-6. 2015.
6. Anibijuwon II, A.O Udeze", Antimicrobial Activity of Carica Papaya (Pawpaw Leaf)on Some Pathoenic Organisms of Clinical Origin from South-Western Nigeria," Ethnobotanical Leaflets, vol. 7, no. 4, pp. 850-864.2009.
7. A.C. Emeruwa, "Antibacterial Subbstance From Carica papaya Fruit Extract,"Journal of Natural Products, vol. 45, no. 2, pp. 123-127. 1982.

8. R.S. Syarifah,"Formulation of Papaya Leaf Extract (Carica Papaya L.) Peel-Off Gel Antibacterial Activity on Propionibacterium Acnes. Thesis. Bandung Islamic University. 2015.F.F. Renita,"Antibacterial Activity of Ethanol Extract of Seeds and Leaves ofPapaya (Carica papayaL.) on Propionibacterium acnesCauses of Acne. Thesis. University of Sumatera Utara. 2017.

9. N.N. Azwanida, "A Review on the Extraction MethodsUse in Medicinal Plants, Principlle, Strength and Limitation,"Med Aromat Plants, vol. 4, no. 3, pp. 1-6. 2015.