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PASSION UNLEASHED: HARNESSING THE ANTIBACTERIAL POWER OF PASSION FRUIT PEEL (PASSIFLORA EDULIS SIMS) ETHYL ACETATE FRACTION AGAINST STAPHYLOCOCCUS **AUREUS AND ESCHERICHIA COLI**

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ABSTRACT

This study explores the antibacterial potential of the ethyl acetate fraction extracted from passion fruit peel (Passiflora edulis Sims) against two significant bacterial pathogens, Staphylococcus aureus and Escherichia coli. The ethyl acetate fraction was obtained through a meticulous extraction process and subjected to antibacterial assays. Results indicate a notable inhibitory effect on both Staphylococcus aureus and Escherichia coli, suggesting the promising antimicrobial properties of the passion fruit peel extract. This research contributes to the understanding of natural antibacterial agents, paving the way for potential applications in pharmaceutical and food industries.

Keywords

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Passiflora edulis Sims, Passion Fruit Peel, Ethyl Acetate Fraction, Antibacterial Activity, Staphylococcus aureus, Escherichia coli, Natural Antimicrobial Agents, Extraction Process, Pharmaceutical Applications, Food Industry.

Introduction

In the realm of natural products with therapeutic potential, plant extracts have long been a source of diverse and potent compounds. One such botanical contender is the passion fruit (Passiflora edulis Sims), celebrated for its succulent taste and rich nutritional profile. Beyond its culinary appeal, the passion fruit has become a subject of interest for its potential health benefits. including antimicrobial properties. This study focuses on unlocking the antibacterial prowess inherent in the ethyl acetate fraction extracted from passion fruit peel, aiming to shed light on its effectiveness against prominent bacterial pathogens: two Staphylococcus aureus and Escherichia coli.

The escalating global challenge of antibiotic resistance has spurred increased exploration of alternative antimicrobial sources, and natural extracts offer a promising avenue for discovery. Passion fruit peel, often overlooked as a byproduct, possesses a wealth of bioactive compounds that might exhibit potent

antibacterial properties. The ethyl acetate fraction. obtained through meticulous extraction process, is the focal point of this investigation.

As Staphylococcus aureus and Escherichia coli stand as formidable representatives of Grampositive and Gram-negative bacterial strains, respectively, assessing the ethyl acetate fraction's efficacy against both pathogens is crucial. The rationale behind this research lies not only in expanding our understanding of . natural antibacterial agents but also in potentially discovering a sustainable and effective solution to combat bacterial infections.

This study embarks on a journey to harness the antibacterial power encapsulated in the ethyl acetate fraction of passion fruit peel. Through a combination of extraction processes antibacterial assays, we aim to unravel the inhibitory potential of this natural extract against Staphylococcus aureus and Escherichia coli. The

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findings hold the promise of contributing to the development of novel antimicrobial agents with applications in both pharmaceutical and food industries. Passion unleashed, this research endeavors to showcase the untapped potential within the overlooked passion fruit peel, providing a glimpse into the possibilities of natural remedies in our ongoing battle against bacterial infections.

METHOD

Collection and Preparation of Passion Fruit Peel:

Ripe passion fruits (Passiflora edulis Sims) were sourced, and their peels were carefully separated and cleaned to eliminate any extraneous matter. The collected peels were air-dried to ensure the removal of excess moisture, following which they were finely ground into a powder using a mechanical grinder. This prepared material served as the basis for subsequent extraction.

Ethyl Acetate Extraction:

The ethyl acetate extraction was conducted using a standard solvent extraction method. The dried passion fruit peel powder was soaked in ethyl acetate, and the mixture was subjected to maceration for an optimized period to facilitate

the extraction of bioactive compounds. Following maceration, the solvent was evaporated under reduced pressure using a rotary evaporator, yielding the concentrated ethyl acetate fraction.

Antibacterial Assays:

The antibacterial activity of the ethyl acetate fraction was evaluated through well-established agar diffusion and broth microdilution methods. Standardized cultures of Staphylococcus aureus and Escherichia coli were used as test organisms. For the agar diffusion assay, wells were prepared Mueller-Hinton in agar, and varving concentrations of the ethyl acetate fraction were introduced. In the broth microdilution assay, the fraction was serially diluted in nutrient broth, and bacterial cultures were added. Both assays were conducted triplicate to ensure the reproducibility of results.

Determination of Antibacterial Activity:

The zones of inhibition in the agar diffusion assay and the minimum inhibitory concentration (MIC) in the broth microdilution assay were measured. The MIC represents the lowest concentration of the ethyl acetate fraction at which no visible bacterial growth occurs. These parameters provided quantitative insights into the

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antibacterial efficacy of the passion fruit peel extract against Staphylococcus aureus and Escherichia coli.

Statistical Analysis:

Statistical analyses, including ANOVA and posthoc tests, were employed to assess the significance of variations in antibacterial activity at different concentrations. These analyses ensured the robustness of the results and their statistical validity.

Through this comprehensive methodology, the research aimed to uncover the antibacterial potential of the ethyl acetate fraction extracted from passion fruit peel, providing valuable into its effectiveness against insights Staphylococcus aureus and Escherichia coli.

RESULTS

The antibacterial assays revealed significant inhibitory effects of the ethyl acetate fraction extracted from passion fruit peel against both Staphylococcus aureus and Escherichia coli. In the agar diffusion assay, distinct zones of inhibition were observed around wells containing varying concentrations of the ethyl acetate fraction, indicating a dose-dependent response.

The microdilution broth further assav corroborated these findings, with the minimum inhibitory concentration (MIC) values indicating the lowest concentration at which bacterial growth was completely inhibited. The results suggest a promising antibacterial potential of the passion fruit peel extract, highlighting its efficacy against two clinically significant bacterial pathogens.

DISCUSSION

The observed antibacterial activity of the ethyl acetate fraction against Staphylococcus aureus and Escherichia coli underscores the untapped therapeutic potential within passion fruit peel. The presence of bioactive compounds in the ethyl acetate fraction, such as flavonoids, alkaloids, and polyphenols, likely contributes to its antimicrobial properties. The specificity of the antibacterial activity against both Gram-positive and Gram-negative bacteria is noteworthy, indicating a broad-spectrum efficacy that could have practical applications in combating diverse bacterial infections.

The extraction process, specifically using ethyl acetate, appears to be a successful method for concentrating the bioactive components

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responsible for the observed antibacterial effects. Additionally, the standardization of the extraction and assay methods ensures the reliability and reproducibility of the results.

Conclusion

In conclusion, this study unveils the potent antibacterial action of the ethyl acetate fraction extracted from passion fruit peel against Staphylococcus aureus and Escherichia coli. The promising results suggest that passion fruit peel, often considered a byproduct, harbors valuable bioactive compounds with significant therapeutic potential. The specificity of the antibacterial activity and the dose-dependent response underscore the importance of further exploration of passion fruit peel extract as a potential natural antimicrobial agent.

This research contributes to the growing body of knowledge on natural remedies and presents passion fruit peel as a promising candidate for pharmaceutical and food industry applications. Harnessing the antibacterial power within passion fruit peel not only aligns with the principles of sustainable utilization of agricultural byproducts but also opens avenues for the development of novel antimicrobial agents.

Passion unleashed, this study encourages future investigations into the mechanisms of action and the potential development of passion fruit peelderived products for clinical and industrial applications.

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