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BIOACTIVE POTENTIAL OF SELENICEREUS UNDATUS AND MUSA ACUMINATA COLLA: A STUDY ON THEIR ANTIMICROBIAL AND ANTI-INFLAMMATORY ACTIVITIES

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ABSTRACT The study the bioactive potential of Selenicereus undatus (dragon fruit) and Musa acuminata Colla (banana) through their antimicrobial and anti-inflammatory activities. Ethonolic extracts of both plants were tested against a range of bacterial and fungal strains using agar diffusion and broth microdilution methods. The results revealed significant antimicrobial activity, particularly against Escherichia coli and Staphylococcus aureus. Additionally, the extracts exhibited potent anti-inflammatory properties by inhibiting protein denaturation and stabilizing red blood cells invitro. Phytochemical screening confirmed the presence of flavonoids, phenolics, and alkaloids, which are likely responsible for the observed bioactivities. These findings suggest the potential of S. undatus and M. acuminata Colla as sources of natural antimicrobial and anti-inflammatory agents, warranting further exploration for pharmaceutical applications.

KEYWORDS : Selenicereus undatus, Musa acuminata Colla, antimicrobial activity, anti-inflammatory activity.

INTRODUCTION

Fruits represent a major part of the human diet. Besides, consumption of fruits may be part of religious practices and as nutritional therapy in different human traditions around the world. Studies show that the role of fruits and their nutrients in protecting against NCDs could be stronger than that of vegetables (Chang et al., 2016). In this study, the focus is on white dragon fruit (Hylocereus undatus) and red banana (Musa acuminata) with the aim of identifying the bioactive compounds present in these fruits and estimating their potential therapeutic effects (Bassiag et al., 2023c).

Medicinal Plants Considered in the Present Study

Musa acuminata Colla

Bananas are known by the scientific name Musa acuminata (Musa sp.), a very popular fruit in the world market. It can be eaten raw or processed, and flour is used as a functional ingredient in various food products (Singh et al., 2016). Musa acuminata Colla is a wild species of banana that is native to Southeast Asia. Various parts of the Musa plant have been used orally or topically as remedies in folk medicine, and some studies have demonstrated this medicinal potential. All parts of the plant, which include the roots, stem, pseudostems, leaves, fruits, and flowers, have long been used in local and traditional medicine in America, Asia, Oceania, India, and Africa (Zhang et al., 2005).

It has traditionally been used for antidepressants, antibacterials,antihypertensives, antiulcerogenics, and antihelminthics. This indigenous knowledge, passed down from generation to generation in various parts of the world, has significantly contributed to the development of different traditional systems of medicine (Sharma, 2023).

Elenicereus Undatus

Pitahaya, or the pitaya fruit, is a well-known member of the Cactaceae family and is widely cultivated in tropical and subtropical areas (Ortiz & Takahashi, 2015). Pitaya fruit is classified based on the color of the pulp and peel, namely white-pulp with pink peel pitaya (Hylocereus undatus), red-pulp with pink peel pitaya (Hylocereus polyrhizus), and white-pulp with yellow skin (Hylocereus megulanthus) (Huang et al., 2021). It goes by several alternative names, such as Pitaya, Moon Lovers, Night Blooming Cereus, Strawberry Pear, Belle of the Night, and Conderella Plant.

Antimicrobial Activity

Microorganism

Microorganisms provide the models used in molecular biology for research. The course of an infection is determined by three factors: the microorganisms, host resistance, and treatment. The most important of these is the interaction between the host and the pathogenic microorganisms, i.e., the balance between the virulence of the pathogens and the resistance of the host pathogens (Invitro Antimicrobial Activity of Plant Extracts by Turbidity Method, n.d.).

Pseudomonas Aeruginosa

Pseudomonas spp are rod-shaped, Gram-negative gamma-proteobacteria found in many different environmental niches, including soil, water, plants, and animals, including insects and other invertebrates. Pseudomonas aeruginosa is uncommonly related to skin and soft tissue infections (SSTIs), such as infections in ulcerated feet occurring in patients with diabetes mellitus, also known as diabetic foot infections (Pelegrin et al., 2021). P. aeruginosa is a common cause of nosocomial infections, manifesting as pneumonia, surgical site infections, urinary tract infections, and bacteremia.

E. coli

Escherichia coli is a non-spore-forming, Gram-negative bacterium, usually motile by peritrichous flagella. Escherichia coli is the most common cause of acute urinary tract infections as well as urinary tract sepsis. It has also been known to cause neonatal meningitis and sepsis, as well as abscesses in a number of organ systems. A list of some of the strains of E. coli that can cause a number of illnesses is provided in this chapter. Virulence types of E. coli include enterotoxigenic, enteroinvasive, enteropathogenic, and vero cytotoxigenic (Percival & Williams, 2014).

Candida Albicans

The total number of eukaryotic species on Earth has recently been estimated at 8.7 million, with fungi making up approximately 7% (611,000 species) of this number. Of all fungi, only around 600 species are human pathogens (Brown et al., 2012).

Anti-flammatory

Inflammation

Inflammation is an essential immune response that enables survival during infection or injury and maintains tissue homeostasis under a variety of noxious conditions. Inflammation comes at the cost of a transient decline in tissue function, which can in turn contribute to the pathogenesis of diseases of altered homeostasis (Medzhitov, 2010).

Cells like macrophages switch phenotypes, secreted molecules like reactive oxygen intermediates switch impact from pro- to anti-inflammatory, and additional mediators of

resolution arise, including proteins, lipids, and gasses. Aside from the persistence of initiating stimuli, nonresolution may result from deficiencies in these mechanisms when an inflammatory response begins either excessively or sub normally (Nathan & Ding, 2010).

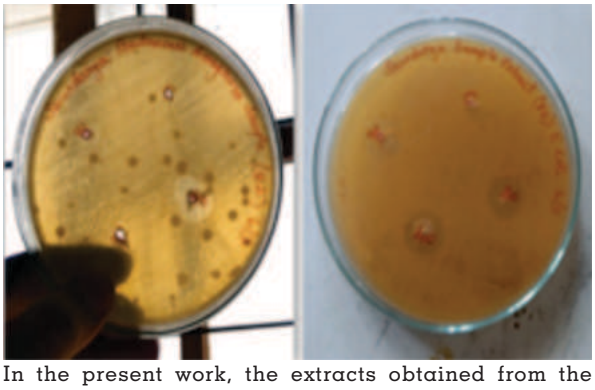
Inflammation plays an important role in various diseases, such as rheumatoid arthritis, atherosclerosis, and asthma, which all show a high prevalence globally. During an inflammatory response, mediators, such as pro-inflammatory cytokines, including interleukin IL-1, tumor necrosis factor (TNF), interferon (INF)-□, IL-6, IL-12, IL-18, and the granulocyte-macrophage colony-stimulating factor, are released; this response is antagonized by anti-inflammatory cytokines, such as IL-4, IL-10, IL-13, IFN-α, and the transforming growth factor (Mueller et al., 2010).

RESULT & DISCUSSION

Collection of Plant Samples and Extraction Methods

The plant samples are collected at a department store in Coimbatore, Tamil Nadu, India.

The composition of Selenicereus undatus and Musa acuminata Colla (1:1) is extracted using a 70% hydroethanolic solution.



In the present work, the extracts obtained from the composition of Selenicereus undatus and Musa acuminata show strong activity against most of the tested bacterial strains. The growth inhibition zone measured ranged from 11 to 20 mm for all the sensitive bacteria.

4.4.2 Antifungal Activity by Agar Well Diffusion Method

The antifungal activity of the extracts of the composition of Selenicereus undatus and Musa acuminata is studied in various concentrations, such as 20, 30, and 40 μg/ml, against one fungal strain (Candida albicans). The antifungal potential of extracts was assessed in terms of the zone of inhibition of fungal growth. The results of the antifungal activities are presented in Table 5.

The antifungal activity of the fruit extracts increased linearly with an increase in the concentration of extracts (μg/ml). As compared with standard drugs, the results revealed that the extracts had fungal activity. The growth inhibition zone measured ranged from 11 to 20 mm for all the sensitive bacteria and from 14 to 20 mm for fungal strains. The results show that the fruit extracts were found to be more effective against all the microbes tested (Bhalodia & Shukla, 2011b).

Anti-inflammatory Activity

The hydroethanolic extract of the composition of Selenicereus undatus and Musa acuminata Colla is able to inhibit protein denaturation in a concentration-dependent manner, and the inhibitory effect of different leafy vegetables at different concentrations (10–50 μg/mL) on protein denaturation is shown in Figure 4.

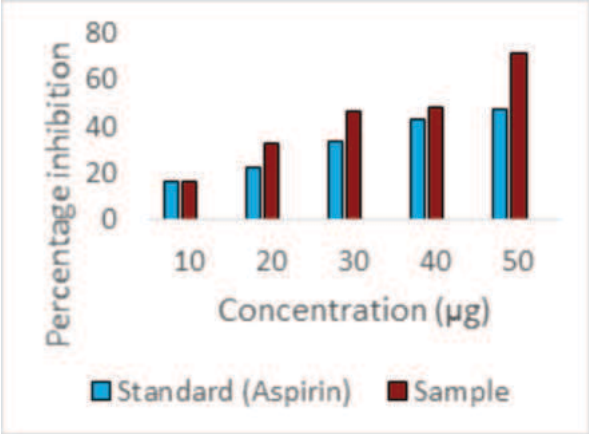


Figure 9: Anti-inflammatory Activity of Fruit

It shows that the fruit extract, when compared with standard aspirin inhibition levels, is within the range of 16.21%, 32.43%, 46.62%, 48.64%, and 71.62% within a concentration of 10–50 μg/ml and has a maximum inhibition of 71.62% at a 50 μg/ml concentration of fruit extract. These correlation studies indicate that the evaluated anti-inflammatory properties may be related to the presence of antioxidant bioactives such as polyphenols and flavonoids (Gunathilake et al., 2018). The fruit extract showed very strong percent inhibition with IC_{50} values of 46.046 μg/ml.

SUMMARY AND CONCLUSION

The present study is entitled as Bioactive Potential of Selenicereus Undatus And Musa Acuminata Colla: A Study On Their Antimicrobial And Anti-Inflammatory Activities". The salient finding of the current study is summarized as follows:
It is observed that hydroethanolic extracts possess good antimicrobial activity that acts by suppressing the growth of microorganisms (Pseudomonas aeruginosa, Escherichia coli, and Candida albicans).

The various in vitro models show that these fruits have a significant source of natural anti-inflammatory activity. However, the current study revealed that the fruit extract has anti-inflammatory activity through the protein denaturation method.

REFERENCES

1) Adewusi, E. A., Moodley, N., & Steenkamp, V. (2010). Medicinal plants with cholinesterase inhibitory activity: A Review.
2) Ahn, K. S. (2017). The worldwide trend of using botanical drugs and strategies for developing global drugs. Journal of Biochemistry and Molecular Biology, 50(3), 111–116.
3) Ali, G. Y., Algohary, E. H. S. S., Rashed, K. A., Almoghanum, M., & Khalifa, A. A. (2011). Prevalence ofCandidacolonization in preterm newborns and VLBW in neonatal intensive care unit: role of maternal colonization as a risk factor in transmission of disease. Journal of Maternal-fetal & Neonatal Medicine, 25(6), 789–795.
4) Ali, S., Khan, M. R., Ullah, I., Sajid, M., & Zahra, Z. (2018). Phytochemical investigation and antimicrobial appraisal of Parrotiopsis jacquemontiana (Decne) Rehder. BMC Complementary and Alternative Medicine, 18(1).
5) Al-Snafi, A. E. (2021). Medicinal Plants with neuroprotective effects. GSC Biological and Pharmaceutical Sciences, 17(1), 213–231.
6) Anokwuru, C. P, Esiaba, I., Ajibaye, O., & Adesuyi, A. O. (2011). Polyphenolic

Content and Antioxidant Activity of Hibiscus sabdariffa Calyx. Research Journal of Medicinal Plant, 5(5), 557–566.
7) Antolovich, M., Prenzler, P. D., Patsalides, E., McDonald, S., & Robards, K. (2001). Methods for testing antioxidant activity. Analyst, 127(1), 183–198.
8) Antolovich, M., Prenzler, P. D., Patsalides, E., McDonald, S., & Robards, K. (2001b). Methods for testing antioxidant activity. Analyst, 127(1), 183–198.
9) Sharma, S. (2023). Comprehensive Review of Musa paradisiaca Kadali: Ethnobotanical, Phytochemical, and Pharmcological Insights into a Versatile Medicinal Plant. In International Journal of Science and Research (IJSR) (Vol. 12, Issue 8).
10) Singh, B., Singh, J., Kaur, A., & Singh, N. (2016). Bioactive compounds in banana and their associated health benefits – A review. Food Chemistry, 206, 1–11.
11) Tallapally, M., Sadiq, A. S., Mehtab, V., Chilakala, S., Vemula, M., Sumana, C., & Upadhyayula, V. (2020b). GC-MS based targeted metabolomics approach for studying the variations of phenolic metabolites in artificially ripened banana fruits. LWT, 130, 109622.