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Medicinal Potential of Plumeria Alba Linn: A Review of Its Phytochemistry and Pharmacological Activities

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ABSTRACT

Plumeria alba, popularly known as white frangipani, is a little decorative tree that is well known for its cultural, medicinal, and aesthetic values. This review emphasises current scientific knowledge on the botanical description, phytochemistry, pharmacological properties and potential applications of P. alba. Studies indicate that the plant possesses various bioactive compounds with therapeutic potentials, including antimicrobial, antiarthritic and antioxidant effects. However, further clinical research is warranted to validate these findings and explore sustainable uses of this species.

Keywords: Plumeria alba, White frangipani phytochemistry, pharmacological properties.

I. INTRODUCTION

For centuries, plants have served as the foundation of traditional medicine, supplying bioactive chemicals for the treatment of a wide range of disorders. White frangipani or Plumeria alba, is commonly utilized in several areas for its medicinal benefits. It has both decorative and therapeutic uses and is frequently seen in temples and gardens. Modern phytochemical and pharmacological investigations have started to corroborate traditional assertions and examine its use in modern medicine (Sura et al.,2016).

II. BOTANICAL DESCRIPTION

P. alba is a small, ornamental tree characterized by:
Leaves: Oblong-lanceolate, dark green, arranged alternately
Flowers: White with yellow centers, waxy texture, strongly fragrant
Latex: Milky and potentially toxic
Fruit: Follicle (rarely observed in cultivation.

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Its flowers and leaves are often used in medicinal preparations, while the latex contains compounds with purgative properties (Imrana& Asif, 2021).

III.PHYTOCHEMISTRY

The phytochemical composition of Plumeria alba is rich and diverse, which largely accounts for its wide range of pharmacological properties. Numerous groups of bioactive chemicals, such as flavonoids, saponins, terpenoids, iridoids, phenolic acids, and essential oils, have been isolated and characterized in studies. These substances work together to produce the therapeutic effects seen in both contemporary and traditional medicinal settings.

Phytochemical screening of P. alba reveals the presence of flavonoid, steroid, volatile oil and phenolic compound.Saponins and tannins have also been identified, which contribute to its antimicrobial activity (Mohammed, S. A. et. al. 2020)

In the water-based latex extract of Plumeria alba L. The presence of carbohydrates, proteins, glycosides, phenolic compounds, tannins, terpenoids, diterpenes, flavonoids, steroids, saponins, coumarins, gums, mucilage, oils, and fats is noted. In contrast, the PAA extract contained no alkaloids. In the methanolic latex extract of Plumeria alba L. The presence of PAM proteins, glycosides, phenolic compounds, tannins, flavonoids, steroids, saponins, gums, and mucilage was identified. Carbohydrates, alkaloids, terpenoids, diterpenes, coumarins, oils, and fats were absent from the PAM extract. It was observed that none of the extracts contained alkaloids.In the methanolic latex extracts, it was noted that proteins, gums, and mucilage were present in greater amounts than other phytochemicals (Rajhans& Pandya 2022).

IV. PHARMACOLOGICAL ACTIVITIES

4.1 Antioxidant Activity

The plant's leaf and flower extracts exhibit moderate to strong antioxidant activity. The total antioxidant capacity (TAC) of the flower and leaf oils are 57 μg/g and 83 μg/g, respectively. Leaf extracts generally display stronger DPPH radical scavenging than flower extracts, attributed to a higher polyphenol content (Mamattah, 2023).

4.2 Analgesic effect

In animal models, ethanolic extracts of P. alba flowers significantly reduced writhing induced by acetic acid and increased latency time in hot plate tests. These analgesic effects were dose-dependent and supported the traditional use for pain relief. These findings suggest that P. alba flower extracts possess peripheral and central analgesic properties (Vinotha et. al. 2021).

4.3 Antimicrobial activity

The extracts derived from the leaves and flowers show a wide range of antimicrobial properties against bacteria such as E. coli and Staphylococcus aureus, as well as against fungi such as Candida albicans(Rakhmawati, 2022).

4.4 Antiarthritic activity

The ethyl acetate and n-butanol fractions of P. Alba exhibits antiarthritic properties in Sprague-Dawley rats.P. Alba offers a scientific explanation for the traditional use of the plant in treating inflammatory conditions, such as rheumatoid arthritis(Choudhary, M. et. al. 2014).

V. BIOTECHNOLOGICAL AND INDUSTRIAL APPLICATIONS

Green Synthesis of Nanoparticles

Recent studies have shown that P. alba flower extract can be used to synthesize chitosan-coated cadmium nanoparticles (Ch-CdNPs) with significant insecticidal and antimicrobial activity (Rani et al., 2023). These nanoparticles also demonstrated effective photocatalytic degradation of dyes such as methylene blue and methyl orange, revealing potential environmental applications(Suriyakala, G. et. al. 2023).

VI. CONCLUSION

Plumeria alba L. demonstrates a wide range of medicinal properties supported by traditional knowledge and modern pharmacological research. It contains numerous bioactive compounds with significant antioxidant, antimicrobial, antarthritic, and analgesic activities. Moreover, its role in green nanotechnology and environmental applications positions it as a sustainable natural resource. Continued pharmacological and clinical research is necessary to further validate its efficacy and safety in modern medicine.

REFERENCES

[1]. Sura J, Dwivedi S, Dubey R. Pharmacological, phytochemical, and traditional uses of Plumeria alba LINN. An Indian medicinal plant. SPER J Anal Drug Regul Aff 2016;1(1):14-17.

[2]. Imrana, M., & Asif, M. (2021). Morphological, ethnobotanical, pharmacognostical and pharmacological studies on the medicinal plant Plumeria alba Linn. (Apocynaceae). Arab. J. Med. and Arom. Plants, 6(1), 1–10.

[3]. Mohamad, S. A., Adzahar, N. S., Akhtar, M. N., Zareen, S., & Lee, T. C. Phytochemical Analysis and GC-MS Profiling in the Flower of Plumeria alba. Materials Science Forum, (2020),Vol. 981, 280–284.

[4]. Rajhans, S., & Pandya, H. Phytochemical Characterization and Antioxidant Potential of Latex Extracts of Cardiotoxic Plants-Cascabelathevetia (L.) Lippold and Plumeria alba L. Toxicology International, (2022),29(4), 567-581.

[5]. Mamattah, M. M. et al ,Chemical characterization, antioxidant, antimicrobial, and antibiofilm activities of essential oils of Plumeria alba. Biochem.Res. Int .Vol 2023,1-10,Article ID 1040478,

[6]. Vinotha, Sathiya& Ms, Umamageswari& A, Umamaheswari& S, Velarul. (2021). Evaluation Of The Analgesic Activity Of Aqueous And Alcoholic Extract Of Flowers Of Plumeria Alba LinnIn Experimental Animals. Asian J Pharm. Clini. Res., 172-174, 10.22159/Ajpcr.2021.V14i4.40644.

[7]. Rakhmawati, A. Antimicrobial Activity and Chemical Composition Analysis of Jasminum Sambac L. and Plumeria Alba L. Flower Extracts Trop. J Nat Prod Res 2022, 6 (3), 330-338, doi.org 10.26538

[8]. Choudhary, M., Kumar, V., Gupta, P., & Singh, S. (2014). Investigation of antiarthritic potential of Plumeria alba L. leaves in acute and chronic models of arthritis. BioMed Res Int. Vol.2014(1),474616.

[9]. Suriyakala, G., Sathiyaraj, S., Balasundaram, M. et al. Plumeria alba flower extract-mediated synthesis of recyclable chitosan-coated cadmium nanoparticles for pest control and dye degradation. Bioprocess Biosyst Eng 46, (2023),1483–1498.