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Antimicrobial and Antioxidant Review of *Pouteria campechiana*

Authors: Ms. Jyothi A.[1*], Adeeba K.N.[2] , Mohammed Fardheen P.[2], Mohammed Sanfeer S.[2] , Sakhi E.S.[2]
Dr.A..Renjith Alex[3], Dr.
Sapna Shrikumar [4]

[1] *Associate professor, Dept.of Pharmaceutical Chemistry Ahalia School of Pharmacy, Palakkad, India*
[2] *Eighth semester Bpharm, Ahalia School of Pharmacy, Palakkad, India*
[3]*Professor& HOD, Dept.of Pharmaceutical Chemistry, Ahalia School of pharmacy, Palakkad, India*
[4]*Professor, Dept.of Pharamcognosy, Ahalia School of Pharmacy, Palakkad, India*

Abstract: Pouteria campechiana (Kunth) Baehni, locally called canistel or egg fruit, is an evergreen, tropical fruit tree belongs to Sapotaceae family. Traditionally, P. Campechiana has been cultivated for its palatable fruit. Lately, the potential application of
P. Campechiana in medicine, especially in its anti-microbial and anti-oxidative properties have received scientists' attention. This review summarizes information from the literature about phytochemical constituents of P. Campechiana and also assess the laboratory findings regarding the anti-microbial and anti-oxidative effect. Highlight is placed on specific compound group like phenolic, flavonoids, carotenoids, and triterpenoids that provide bio-activity of the fruit. Future study needed and limitation of previous investigation were emphasized with the application prospects of the fruit in medicine and nutriceuticals industries.

Key words: Pouteria campechiana, canistel, antioxidant activity, antimicrobial activity, phytochemicals, Sapotaceae

I. INTRODUCTION

Pouteria campechiana (Kunth) Baehni is a member of the *Sapotaceae* family and although known mostly for its nutritious fruit, research has increasingly confirmed that the plant has potent therapeutic potential [17]. In traditional folk medicine it is used for inflammatory and infectious diseases affecting the skin, and is often prescribed for gastro-intestinal upsets; in recent years its popularity as a potent medicinal agent has increased due to its wealth of phytochemical compounds [1]. However, a comprehensive review on the plants anti-oxidant and anti-microbial potential does not seem to be readily available and therefore through this literature review of the available in vitro and experimental data I will evaluate the mechanisms of action and outline the directions future research could take. With the widespread emergence of multi drug resistant organisms and the increasing incidence of the disorders associated with oxidative stress such as cancer, cardiovascular disease, diabetes and neurodegenerative diseases across the world, people are growing ever more interested in plant based bioactive compounds. The synthetic anti-oxidative and anti-microbial compounds which are more convenient and readily available have many undesirable side effects, tend to be toxic and environmentally unfriendly; for these reasons natural products from medicinal plants need to be examined.[5][6][7]

Fig. 1. Pouteria campechiana

II. Botanical description and distribution

The *Pouteria campechiana* is a slow growing, ever green tree reaching the size of 6-10 m[14]. It grows larger on older plants in optimal conditions[14]. It has a brown, somewhat fissured bark. The twigs can be finely pubesce. The leaves are simple, shiny and thick (leathery), alternately arranged, obovate to lanceolate in shape and add a lot to the ornamental quality of the plant[17].

It has ovoid to elliptical fruit with yellow to orange edible flesh. This fruit has a smooth, custardy pulp and high carotene levels[16]. It is native to Mexico (south) and Central America but is widely spread across the tropics and subtropics like the Indian subcontinent, Southeast Asia, West Indies and some parts of Africa. The tree can be grown in tropical regions, requires minimum care and can be easily grown on a commercial scale thus further increasing the prospects for its use as a medicinal or nutraceutical product[14].

III. Phytochemical Composition

Phytochemical studies carried out on *Pouteria campechiana* fruit, leaves, seeds and bark showed a broad distribution of secondary metabolites that posses biological activity[5]. Two of the most common classes are phenolic acids and flavonoids; they are strong redox agents and can effectively interact with various biologic targets[5][8].

Several carotenoids such as-carotene and lutein are responsible for fruit's pigmentation and exhibit potent antioxidant effect[3]. Triterpenoids, sterols, tannins and saponins were also reported to possess multiple biologic activities such as: antimicrobial, anti-inflammatory, disruption of the membrane integrity. These findings indicate that extract formulation factors such as extraction solvent and plant part are extremely important for achieving biologic efficiency due to differential distribution of Phytochemical constituents[1][10].

IV. Antioxidant Properties

Oxidative stress is defined as an imbalance between generation of ROS and the capacity of antioxidant defence system to detoxify ROS, thus causing damages to cellular components[3]. Extracts of *Pouteria campechiana* have shown high antioxidant activity in various in vitro systems, including DPPH scavenging activity, ABTS scavenging activity, FRAP assay, inhibition of lipid peroxidation.

There are consistently high antioxidant activities in both methanolic and ethanolic extract than in aqueous extract, indicating high content of phenolic and flavonoid compounds that may contribute to antioxidant effects[6]. Antioxidant compounds can neutralize the free radicals by donating hydrogen atoms or electron and Chelate pro-oxidant metal ions, Inhibit the oxidative chain reaction of lipid peroxidation. High antioxidant capacity of *P. Campechiana* is indicative of its possible usage in ameliorating disease mediated by oxidative stress and in functional foods and nutraceuticals development[7][8].

V. Antimicrobial Properties

The antimicrobial activity of *Pouteria campechiana* against a wide range of pathogenic microbes has been analysed[2]. Gram-positive bacterial strains (Staphylococcus aureus and Bacillus subtilis) and Gram-negative strains (Escherichia coli and Pseudomonas aeruginosa) were inhibited by various extracts[5]. Differences in the extent of activity were observed due to differences in extract concentration and solvent, and microbial species.

The antifungal activity of *P. Campechiana* has been reported to act against Candida albicans and Aspergillus niger (opportunity pathogens), but has not been investigated as extensively. Putative mechanisms of activity are the leakage of intracellular components by disrupting cell membranes, blocking of nucleic acid synthesis, inactivation of enzymes by phenolics. This information demonstrates that *P. Campechiana* could possibly be used as a natural antibiotic agent, particularly against resistant strains.

VI. Future Prospects

From the obtained results the antioxidant and antimicrobial properties of *Pouteria campechiana* suggest potential applications in the areas of pharmacy, nutraceuticals and food industry for their shelf-life stability. However, most of the works carried out in this field have focused mainly on in vitro systems and thus there is need for conducting in vivo studies for evaluating its bioavailability, toxicity and pharmacokinetics and therapeutic efficacy. The use of modern sophisticated tools like HPLC, GC-MS, metabolomics for identifying and isolating specific active compounds would further enlighten the future research. Comparative studies using combined extracts of *P. Campechiana* with conventional antimicrobials could explain its modulatory role in the resistant cases. Commercial use or development as therapeutic agents will require standardized extracts and human clinical trial.

VII. Conclusion

In summary, *Pouteria campechiana* is an overlooked but valuable medicinal plant which possesses good potential antimicrobial and antioxidant activities, largely based on its phytochemical constituents. Traditional uses supported by current scientific evidence suggests that it is indeed a valuable source of bio active compounds, but further extensive pharmacological and clinical studies are needed to establish the full potential of this plant as a medicine.

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