

**POUTERIA CAMPECHIANA: A SHORT REVIEW****Fasna A.*, Farhana, Duniya Jebin and Aiswarya G.**

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Pharmacy, Vellimadukunnu,
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India.**ABSTRACT**

The *Pouteria campechiana* belongs to the family *Sapotaceae* and can be widely found around the World. These plants have been used as building material, as food, because the eatable fruits, as well as remedies in folk medicine. Some biological activities have been reported to species of this plant such as antioxidant, anti-inflammatory, antibacterial and antifungal. However, the real potential of this plant as source of new drugs or phytomedicines remains unknown. Therefore, a review of the so far known chemical composition and biological activities of this plant is presented to stimulate new studies about the species.

INTRODUCTION

The *pouteria campechiana* have been used for medicinal purposes. It have been known to possess diverse biological activity as antioxidant, anti-inflammatory, antibacterial and antifungal activity and an important source of many biological active compounds. For a long period of time, plants have been a valuable source of natural products for maintaining human health, especially in the last decade, with more intensive studies for natural therapies. The antimicrobial effects of these plant was attributed to the number of phytochemical constituents like flavanoids and triterpenes.

A Short Review on *Pouteria Campechiana* Pharmacognostical Review

pharmacognostical study of *Pouteria campechiana* (Kunth) Baehni family *Sapotaceae* was carried out. Literature survey on several *Pouteria* species was reviewed. A botanical study including macro- and micro-morphological characters of the plant organs were presented for their identification in the entire or powdered forms. Secondary metabolites of *Pouteria campechiana* organs were analyzed for the first time via high resolution UPLC-PDA-qTOF-MSn which resulted into detection of sixty three chromatographic peaks belonging to various

classes. The composition of lipoidal matter was analyzed using GLC technique. Furthermore, chemical analysis was conducted to isolate and identify the major constituents of *Pouteria campechiana* and resulted into the isolation and identification of ursolic acids, 2 α , 3 α , 19 α , 23 tetrahydroxy ursenoic acid, quercetin, myrcitin, myricetin-3-O- β -galactoside and protocatechuic acid for the first time, beside myricetin-3-O- α -L-rhamnoside and gallic acid, which were detected before in *Pouteria campechiana*. Total phenolic and flavonoidal contents were estimated spectrophotometrically in addition to determination of tannin content by hide powder gravimetric method. Biological study was conducted including evaluation of the anti-inflammatory, analgesic, antiulcerogenic activities using carrageenan-induced paw oedema method, hot plate method and ethanol induced ulcer model, respectively. Moreover, antioxidant and antimicrobial properties were assessed by measuring free radical 1,1-diphenyl-2-picrylhydrazyl (DPPH) scavenging activity and agar well diffusion assay methods. Results revealed that the seeds ethanolic extract has higher anti-inflammatory effect than that of the leaves, while the leaves ethanolic extract exhibit higher analgesic activity. Both leaves and seeds ethanolic extracts exhibited a significant decrease in gastric ulcer number ulcer and severity. Antimicrobial screening revealed that leaves and seeds ethanolic extracts showed moderate to strong antimicrobial activity. on the other hand, leaves showed higher antioxidant activity than seeds. The nutritive values of the fruit were evaluated and found to be remarkable and encourage the propagation of plant in Egypt.^[1]

Effect of logging on rodent scatter-hoarding dynamics in tropical forests: implications for plant recruitment

The present study tested the hypothesis that logging affects the scatter-hoarding behavior of rodents, which, in turn, negatively affects the quantity and quality of *Pouteria campechiana* (*Sapotaceae*) seed dispersal. A series of seed stations was established in logged and unlogged forests of ejido Señor, Yucatan Peninsula, and comparisons were made between logged and unlogged forests in terms of: (i) seed removal; (ii) number of seeds hoarded; (iii) hoarding distance; and (iv) the number of recruits and the survival of hoarded seeds. The number of both hoarded and removed seeds was significantly higher in unlogged sites. Furthermore, the mean distance of hoarding was greater in unlogged compared with logged sites. Although recruitment and survival were present in both logged and unlogged sites, there were more surviving seedlings in unlogged sites. The data indicate that both the quantity and quality of seed dispersal are negatively affected by logging because of a change in the rodent scatter-

hoarding dynamics. These changes suggest that plant-animal interactions are crucial to the understanding of the ecology and conservation of managed tropical forests.^[2]

PHYTOCHEMICAL REVIEW

Talarofuranone, a New Talaroconvolutin Analog from the Endophytic Fungus *Talaromyces purpurogenus* from *Pouteria campechiana* Seeds

An endophytic fungus *Talaromyces purpurogenus* was isolated from the seeds of the popular edible fruit *Pouteria campechiana*. The fungus was fermented in potato dextrose agar and the fungal media were extracted with EtOAc. Chromatographic separation of the EtOAc extracts over silica gel, Sephadex LH-20 and preparative thin layer chromatography furnished a furanone analogue of talaroconvolutin A, named talarofuranone (1), along with talaroconvolutin A (2), 4-hydroxyacetophenone, tyrosol and ergosterol. The structure of 1 was determined by comparing the NMR data with that of 2 and by HRFABMS.^[3]

Chemical composition and biological activities of *Pouteria campechiana* (Kunth) Baehni

The present study was conducted to evaluate the analgesic, anti-inflammatory and gastroprotective activities of ethanol, de-fatted ethanol extracts and n-hexane fractions of *Pouteria campechiana* (Kunth) Baehni leaves and seeds. Further chemical analysis was done to isolate and identify its bioactive compounds. The seeds ethanolic extract produced 85% inhibition of inflammation in the rat paw oedema test at the dose of 100 mg/kg after 4 h ($p < 0.05$). On the other hand, the leaves ethanolic extract (200 mg/kg) exhibited maximum analgesic activity after 90 min ($p < 0.05$) in the hot plate test. Both leaves and seeds ethanolic extracts showed significant decreases in gastric ulcer number and severity ($p < 0.05$). Phytochemical investigation of *P. campechiana* leaves and seeds yielded six compounds: protocatechuic acid (C1), gallic acid (C2), quercetin (C3), myricetin (C4), myricetin-3-O- α -L-rhamnoside (C5) and myricetin-3-O- β -galactoside (C6). The study supports the use of *P. campechiana* in traditional medicine for conditions associated with inflammation, pain and peptic ulcers.^[4]

Plant Physiology and Fruit Secondary Metabolites of Canistel *Pouteria campechiana*

Canistel (*Pouteria campechiana*) is a newly cultivated fruits in Bangladesh. From this study, we tried to find out plant physiology and also secondary metabolites in hydro-alcoholic, methanol and aqueous extract of canistel fruit. Plant physiological characters were determined by respective instruments and fruit phytochemicals were screened using standard methods. SPAD reading (47.9%), photosynthetic rate ($9.6 \mu\text{mol m}^{-2} \text{s}^{-1}$), stomatal conductance of

H₂O (0.8 μ mol/m³) (348.4 vpm partial pressure (33.8 mBar) and P.A.R incident on leaf surface (271.1 μ mol/m² s) was found out. It yielded 123.6 kg fruit/plant while fruit had 11.6% degree of brix and 61.3mg/100 g fruit Vit.-C with 13.3% moisture. Alkaloids, glycosides, carbohydrates, tannins, terpenoids, steroids, reducing sugar, phlobatannins, proteins, amino acids, lipids, fats and acidic compounds were found to be present but flavonoids, phenolics and saponins were found absent on canistel fruit. Canistel fruit have a number of secondary metabolites and identification of these phytochemicals may be helpful for phytochemists and pharmacologists in future.^[5]

Volatile compounds from *Pouteria campechiana* (Kunth) Baehni

The volatile constituents from fruits of *Pouteria campechiana* (Kunth) Baehni grown in Cuba were studied by GC and GC/MS. The yield of total volatiles, estimated by the addition of a measured amount of internal standard to the sample prior to volatile isolation, was 18.8 mg/kg. Forty-nine compounds were identified, of which the most prominent were methyl 2-hydroxy-4-methyl pentanoate (4.74 mg/kg) and S-methyl 2-propenethioate (2.48 mg/kg).^[6]

Triterpenes and Sterol from *Pouteria campechiana*

The ethyl acetate extract of the stem bark of *Pouteria campechiana* afforded 3 β , 28-dihydroxy-olean-12-enyl fatty acid ester 1, a mixture of a fatty acid ester of oleanolic acid 2a and a fatty acid ester of betulinic acid 2b in a 0.3:1 ratio, and spinasterol 3 by silica gel chromatography. The structures of 1 2b were elucidated by extensive 1D and 2D NMR spectroscopy. The structure of 3 was identified by comparison of its ¹H NMR data with spinasterol. Antimicrobial tests on 1 and a mixture of 2a and 2b indicated that they are slightly active against the bacteria, *Escherichia coli* and *Pseudomonas aeruginosa* and the fungi, *Candida albicans* and *Trichophyton mentagrophytes*. They are inactive against *Staphylococcus aureus*, *Bacillus subtilis*, and *Aspergillus niger*.^[7]

The carotenoids of *Pouteria campechiana* (sinhala: ratalawulu)

The yellow fruit lavalu found in Sri Lanka has been confirmed by taxonomical studies as *Pouteria campechiana* (Sinhala: Ratalawulu). This is the only yellow lavalu found in Sri Lanka and is not of the *Chrysophyllum* species. The leaf, fruit and seed characteristics were studied and compared with herbarium specimens at the National Herbarium. The carotenoids were dominated by neoxanthin. Total carotenoid content was high and varied from 1.9 to 23.5 mg.g⁻¹ dry weight (DW). Individual carotenoid concentrations varied markedly from specimen to specimen (β -carotene, from traces to 156, ζ -carotene, trace amounts, β -

cryptoxanthin, from traces to 1106, violaxanthin, from less than 188 to 1151, neoxanthin, from 1594 to 19,270, unidentified I, from traces to 627, unidentified II, from 68 to 1162, $\mu\text{g.g}^{-1}\text{DW}$). Due to the presence of a carbohydrate gum the normal extraction procedure for carotenoids had to be modified. Identification was done after separating by open column chromatography (OCC) by using visible spectral data, chemical tests, thin layer chromatography (TLC) as well as high performance liquid chromatography (HPLC). Quantification was mainly carried out by HPLC using β -apo-8'-carotenal as the internal standard. Results showed two extremes of retinol equivalents (RE) in *Pouteria campechiana* (traces and 759 to 11,813 RE.100g⁻¹ DW). These ranges as well as the varying shapes of fruit are indicators that the trees are extremely hybridized. However, its carotenoid profile and high colour intensity could give rise to antioxidant properties and also find use as a natural food colourant as it has an unusually high concentration of total carotenoid.^[8]

PHARMACOLOGICAL REVIEW

Antinociceptive and Antihyperalgesic Activity of a Traditional Maya Herbal Preparation Composed of *Pouteria Campechiana*, *Chrysophyllum Cainito*, *Citrus Limonum*, and *Annona Muricata*

Preclinical Research The purpose of this work was to assess the antinociceptive and antihyperalgesic properties of an herbal preparation, composed of four vegetal species: *Pouteria campechiana* (P. campechiana), *Chrysophyllum cainito* (C. cainito), *Citrus limonum* (C. limonum), and *Annona muricata* (A. muricata), that is commonly used in combination (PCCA) in traditional Mayan medicine for the treatment of diabetes and pain. An ethanolic extract of PCCA was prepared at a ratio of 1:1:1:1 for each plant. The systemic antinociceptive effect of PCCA extract (50-600 mg/kg, p.o.) was dose-dependent in the rat formalin (1%) producing 66% antinociceptive response at 400 mg/kg, p.o. A concentration-dependent antinociceptive effect of the PCCA extract (20-160 mg/paw) was also demonstrated in the rat capsaicin (0.2%) test. The PCCA extract (100-400 mg/kg, p.o.) had antihyperalgesic effects in alloxan diabetic rats. These findings demonstrate the antinociceptive and antihyperalgesic effects of PCCA and supports the use of the plant extracts in Mayan folk medicine.^[9]

Antioxidant and hepatoprotective potential of *Pouteria campechiana* on acetaminophen-induced hepatic toxicity in rats

Pouteria campechiana (Kunth) Baehni. is used as a remedy for coronary trouble, liver disorders, epilepsy, skin disease, and ulcer. Therefore, the present study aims to investigate the antioxidant and hepatoprotective effect of polyphenolic-rich *P. campechiana* fruit extract against acetaminophen-intoxicated rats. Total phenolic and flavonoid contents of egg fruit were estimated followed by the determination of antioxidant activities. Treatment with *P. campechiana* fruit extract effectively scavenged the free radicals in a concentration-dependent manner within the range of the given concentrations in all antioxidant models. The presence of polyphenolic compounds were confirmed by high-performance thin-layer chromatography (HPTLC). The animals were treated with acetaminophen (250 mg/kg body weight; p.o.) thrice at the interval of every 5 days after the administration of *P. campechiana* aqueous extract and silymarin (50 mg/kg). Acetaminophen treatment was found to trigger an oxidative stress in liver, leading to an increase of serum marker enzymes. However, treatment with *P. campechiana* fruit extract significantly reduced the elevated liver marker enzymes (aspartate transaminase, alanine transaminase, and alkaline phosphatase) and increased the antioxidant enzymes (viz., superoxide dismutase and catalase) and glutathione indicating the effect of the extract in restoring the normal functional ability of hepatocytes. These results strongly suggest that *P. campechiana* fruit extract has strong antioxidant and significant hepatoprotective effect against acetaminophen-induced hepatotoxicity.^[10]

Isolation and Evaluation of Antimitotic Activity of Phenolic Compounds from *Pouteria campechiana* Baehni

This study was undertaken to determine the compound responsible for the antimitotic activity of ethyl acetate extracts obtained from the leaves of *Pouteria campechiana* Baehni. Six stilbenes and six flavonoid glycosides were purified and identified after chromatographic separation and spectroscopic analysis. The distilbene ampelopsin B was found to arrest mitosis in a cell-based primary screen to monitor cell-cycle progression and was also determined to be a weak microtubule depolymerizer in a secondary assay.^[11]

Immunomodulatory effects of the methanolic extract from *Pouteria campechiana* leaves in macrophage functions

The present study aimed to examine the immunomodulatory properties of the methanolic (MeOH) extract from *Pouteria. campechiana* leaves in peritoneal macrophages of Balb/c

mice. Peritoneal macrophages isolated from mice and Vero cells were treated with the MeOH extract from leaves. Cell viability of the macrophages and Vero cells were evaluated by the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide method. The phagocytic activity, as nitric oxide (NO), hydrogen peroxide (H₂O₂), interleukin 6 (IL-6) and tumour necrosis factor α (TNF- α) production were evaluated on peritoneal macrophages. Results showed that the MeOH extract from leaves was able to stimulate the phagocytic activity and increase NO, H₂O₂ and cytokines production. The viability assays do not show cytotoxic effect on cell viability and cause a significative proliferative effect in the macrophages of a concentration-dependent manner. These results conclude that the MeOH extract from *P. campechiana* leaves possessed a stronger immunostimulatory effect in a concentration-dependent manner without affect the cell viability.^[12]

ANALYTICAL REVIEW

Analysis of polyphenolic antioxidants from the fruits of three *pouteria* species by selected ion monitoring liquid chromatography-mass spectrometry

Pouteria campechiana, *Pouteria sapota*, and *Pouteria viridis* are tropical plants in the *Sapotaceae* family that bear edible fruits. The fresh fruits of these three *Pouteria* species were each extracted, and activity-guided fractionations were performed to identify the antioxidant constituents. Seven polyphenolic antioxidants, gallic acid (1), (+)-gallo catechin (2), (+)-catechin (3), (-)-epicatechin (4), dihydromyricetin (5), (+)-catechin-3-O-gallate (6), and myricitrin (7), were isolated and identified. Extracts of the three *Pouteria* fruits were analyzed by a selected ion monitoring liquid chromatography-mass spectrometry method to quantify their polyphenolic antioxidants. The highest level of the seven measured polyphenols was found in *P. sapota*, the second highest in *P. viridis*, and the lowest in *P. campechiana*. The levels of the seven polyphenols corresponded with the results of the 1,1-diphenyl-2-picrylhydrazyl assay, by which *P. sapota* had the highest antioxidant activity, *P. viridis* the second highest, and *P. campechiana* the lowest.^[13]

CONCLUSION

Evaluation of the biological activities of *Pouteria campechiana* revealed significant anti-inflammatory and analgesic activities of *Pouteria campechiana* seeds and leaves ethanolic extrats together with their potent gastroprotective effect. The antimicrobial screening support the medicinal use of *Pouteria campechiana* seeds and leaves for treatment of some bacterial and fungal infections. The high flavonoidal and phenolic content of *Pouteria campechiana*

leaves besides their antioxidant activity encourage possible medicinal use of the leaves as a natural protective support for free radical oxidation caused diseases. It is recommended to use the plant for the evidenced biological activities as whole extracts rather than fractions to provide the potentiating effects of all constituents. Lots of works have been carried in these plant. These include Antinociceptive, Antihyperalgesic, Antioxidant, Hepatoprotective and Antimitotic activities of *Pouteria campechiana*.

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