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Exploring the Phytochemical and Medicinal Potential of Conocarpus lancifolius (Combretaceae)

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Abstract

Conocarpus lancifolius is used to cure a variety of ailments in traditional medicine. It offers a number of possible health benefits, including anti-cancer, anti-diabetic, antibacterial, and antioxidant properties. Its biological activities are also aided by the abundance of flavonoids, tannins, phenols, alkaloids, and terpenoids. Its detrimental effects, like as obstructing Water and wastewater pipes in homes and causing specific health problems like pollen hyper sensitivity. And asthma, are the subject of ongoing discussion these days. However, the literature that has been released indicates that there may be advantages for humanity. Because of this, this study is more deserving. This study emphasizes Conocarpus lancifolius's promising significance in contemporary medicine by highlighting the most recent findings on its phytochemical composition and therapeutic potential.

Keywords: Conocarpus Lancifolius; Solvents; Extraction method; Active ingredient; Medical uses.

Introduction

Usually, therapeutic plants functioned as the chiefly origin for treating various illness worldwide in ancient ages. Consequently, natural materials have always played a crucial role in promoting and preserving a healthy lifestyle [30]. Conocarpus lancifolius belonging to the genus Conocarpus within the family Combretaceae. This blooming tree is broadly spreed [26,27]. C. lancifolius is a rapidly -growing, heat-tolerant tree that reaches a height of 10 to 30 meters. This evergreen, shrubby tree typically features low branching and multiple trunks. It is characterized by glaucous, medium-green leaves and small greenish flowers that form thick, cone-shaped clusters in terminal panicles during the spring. These flowers are followed by cone-like fruits, measuring approximately half an inch in length, ranging in color from red to brown [33]. The tree also boasts an attractive dark brown bark that is ridged and scaly in texture [6,33,34]. It is an Decorative tree and its mature leaves show glossy Aspect , Both surfaces of the leaves contain relatively few trichomes. [29].

Traditionally, C. lancifolius has been utilized in the treatment of Rhinorrhea, fever, diabetes, diarrhea, and skin sore [1,28]. It is particularly noted for its medicinal properties, including anti-diabetic and cytotoxic effects [31]. Additionally, studies indicate that C. lancifolius serves as fodder for Grazing animals in certain regions, while its wood is used for Energy source, charcoal production, and shipbuilding [32]. Nevertheless, there are very Scant documents revealing the pharmacological importance of C. lancifolius prompting an analysis it's bio Components and their Therapeutic attributes to document its Curative value and determination the optimal conditions for extraction.

The main purpose of this study was a extensive review of uses of Conocarpus lancifolius and determination the optimal conditions of the extraction for the period 2020-2024, Table (1)

Table.1 Compiling summaries for twenty six research studies on Conocarpus lancifolius for the period 2020-2024

NO.	Objective	Solvents	Extraction method	Active ingredient	Results	Year
1	Investigation of the Anti diabetic effect of Hydro-ethanol Leaf extracts from C. lancifolius.	Ethanol extract 60%	Ultra-sonication assisted freeze drying.	Phenolic and flavonoid contents, highest DPPH scavenging activity with an IC50 value including α-amylase and α-glucosidase inhibition.	The 450 mg/kg dose of C. lancifolius leaf extract decreased blood glucose, cholesterol, LDL, and HDL levels, while increasing hemoglobin in diabetic mice.	2020
2	Conduct C. lancifolius leaf aqueous extract (CLAE) to evaluate its free radical scavenger, cardio-protective, anti anxiety, anti-depressant, and nootropic effects using various in vitro, in vivo, and in silica designs.	Aqueous extract 100%	Aqueous extract was used	Total phenolics various flavonoids, antiradical effects through DPPH, TAC and TRP, acetyl cholinesterase (AChE) Suppressing activity.	Cardiovascular-protective, anxiolytic, antidepressant, and memory-enhancing activities were observed. Toxicological analysis revealed no deaths or symptoms of medical toxicity in each single-dose and multiple dose tests. Both the 10% alcohol extract and the 10% aqueous extract inhibited COX-1 enzyme activity, with the alcohol extract showing an 80% inhibition and the aqueous extract demonstrating an 82.3% inhibition.	2023

3	The impact of C. lancifolius leaves on inhibiting the COX-1 enzyme activity, which is associated with pain in thyroid patients.	Alcohol extract 10%, Aqueous extract 10%	Maceration	Carbohydrates, Tannins, flavonoids, Saponins, Glycoside, Terpenoids, Coumarins and Alkaloids.	Both the 10% alcohol extract and the 10% aqueous extract inhibited COX-1 enzyme activity, with the alcohol extract showing an 80% inhibition and the aqueous extract demonstrating an 82.3% inhibition.	2024
4	Evaluate the antibacterial effectiveness, anti-inflammatory Characteristics and in vitro antioxidant activity of C. lancifolius leaf component.	Chloroform, Methanol, Aqueous and Ethanol extracts	The maceration technique	Alkaloids, Anthraquinones free and Anthraquinones bound, Saponins, Flavonoids and Tannins	At a concentration of 100 micrograms/mL, the extract effectively inhibited Gram-positive and Gram-negative micro organisms. It also showed the highest antifungal effect to Candida albicans. Furthermore, the ethanol extract of the leaves repressed Gram -ve and Gram +ve bacteria, in addition to yeast.	2023
5	High performance thin layer chromatography analysis, thin layer chromatography and phytochemical screening.	Hexane, chloroform, and ethanol extracts	Simple maceration method at room temperature	Flavonoids carbohydrates saponins phenols, etc..	Medicine manufacturers are particularly interested in creating novel medications to manage a variety of disease, and the phytochemical study of the plant is quite significant from a commercial standpoint. Our investigation identified key phytochemical characteristics in the native medicinal plant that should help treat a number of illnesses.	2024

6	Analyzing the bioactive substances found in C. lancifolius leaves.	Methanol extract of the leaves	Continuous percolation technique	1-(3-Methoxy-2-nitrobenzyl) iso quinolone 4-ol-6.7-dione 1-bromo-Tilictilyi Piytol lickauecalloic aclu, 2,S-uilivdroxvpfopvI estef, 2,2 :4,2"-terthiophene ethyl iso-allocholate, caryophyllene oxide, campesterol.	The extract demonstrated significant anticancer effect to MCF-7 breast cancer cells. It also showed wide-spectrum antibacterial effect against Gram +ve and Gram-ve bacteria, though with lower potency contrasted to ciprofloxacin.	2021
7	To inhibit the protease produced by Pseudomonas aeruginosa by used an C. lancifolius leaves extract.	Ethanolic alcohol	Dried leaves treating with 80% ethanol for 6 hours.	Sinapic acid p-coumaric acid caffeic acid catechin tannic acid hydroxyl-benzoic acid vanillic acid and gallic acid.	Results demonstrated a reduction in the activity of protease, following treated with 0.8 µg/ml extract.	2023
8	Evaluation of the anti-acetyl cholinesterase, antioxidant and anti-lipoxygenase activities of different C. lancifolius leaf extracts.	Water Methanol Ethanol Ethyl acetate Hexane and chloroform.	Freeze dried plant extracts with liquid nitrogen.	Total flavonoid and phenolic contents.	Ethanolic extraction yielded the largest extract yield, total flavonoids and total phenols. Also demonstrated the large effect 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity, with an IC_{50} value of 55.26 µg/mL. It also showed significant acetyl-cholinesterase and lipoxygenase inhibitory activities (IC_{50}). These results for the ethanolic extract were Significantly different compared to another extracts ($p < 0.05$). Hemolytic percentage data showed that all extracts exhibited minimal or	2021

					negligible toxicity.	
9	Biochemical test for alkaloid component was Conducted for (leaf, fruit, root, flower).	Methanol, water dichloromethane.	Hot continuous extraction by Soxhelet.	Alkaloid (methoxy Phenyloxime) 551.1(g/mol)	Alkaloids were found only in the leaves, with methanol being the most effective solvent. The purified methoxy phenyloxime (MPO) showed the strongest antibacterial activity at 200 µL, but no significant differences were detected against S. aureus depending on MIC values. The MPO molecule exhibited low hemolytic cytotoxicity (1.22%) in healthy human erythrocytes.	2022
10	Detection the optimal conditions of extraction for polyphenolic compounds from multiple parts of Damas species, C. lancifolius, and Conocarpus erectus.	Ethanol	Mixture of ethanol concentration (50, 75, 100%), time (1, 2, , 3 h) and temperature (45, 55, 65 °C) was used.	Phenols Flavonoids Tannins and free of alkaloids.	Altering the extraction conditions impacted the recognition of saponins, phytosterols , and glycosides, in addition to the solubility of vanillic acid, sinapic acid, protocatechuic, t-ferulic acid, rutin hydrate, p-coumaric acid, acid, quercetin, and flavone.	2021
11	In this research, C. lancifolius leaf extract (CLLE) was used as an	Dried powder of C. lancifolius leaf extract	Dried powder of C. lancifolius leaf was used	Flavonoids, Saponins and phenols.	The results indicated that CLLE can accelerate curing	2024

	accelerator.				systems, with the optimal concentration being 0.5 pphr for Styrene_Butadiene Rubber and 1 pphr for Natural Rubber.	
12	the Phytochemical Study of ethyl acetate of Conocarpus lancifolius Engl. leaf.	Dried powder of C. lancifolius leaf extrat	Dried powder of C. lancifolius leaf extrat	Gallic acid, di-hydro myricetin, myricetin, daucosterol, quercetin 3-O-β-D-glucoside, syringetin 3-O-β-D-gluco-pyranoside, gallocatechin, and epigallocatechin-3-O-gallate.	Eight compounds were isolated and identified, and their acetylcholinesterase (AChE) inhibitory activities were evaluated both in vitro and in silico. Daucosterol exhibited the largest effect (IC50 0.316 μM), which supported by the superimposed docking.	2023
13	Detect the antibacterial activity of C. lancifolius leaf extracts to several type of bacteria.	Water Methanol	Maceration for aqueous extract, while Soxhlet apparatus for methanolic extract.	Flavonoids Saponins Alkaloids Tannins Steroids Cardiac glycoside Tri-terpenoids and Anthra-quinones.	The research revealed that methanolic extract of C. lancifolius leaves exhibited better antimicrobial effects compared to the aqueous extract, because of its high amount of components like as tannins, flavonoids, and alkaloids.	2021
14	Evaluate the antibacterial activity of a mixture of leaves (Capparis spinosa L., Conocarpus lancifolius L., and Dodonaea viscosa) .	Water, methanol	The aqueous extract was made by maceration while the methanolic extract was made by Soxhlet.	Alkaloids Flavonoids Phenols Saponins Glycosides and tannins	The polyherbal methanolic extract exhibited better antibacterial activity than the aqueous extract, showing larger inhibition zones against *Pseudomonas aeruginosa* at 100 mg/ml. The extract was more effective to *Staph. aureus*, with MIC and MBC values of 4 mg/ml and 8 mg/ml, successively. For P. aeruginosa, the	2021

					MIC and MBC were 32 mg/ml and 64 mg/ml, successively.	
15	Phytochemical checking ,high-performance thin layer chromatography and thin layer chromatography analysis	Hexane Ethanol Chloroform	Leaf extracts were made depending on the polarity of the solvents.	Carbohydrates, phenols, flavonoids, etc.	The results detect found the phenols,flavonoids, carbohydrates , etc. The HPTLC and TLC were used to accuracy quantify and identify marker compound	2024
16	The effect of C. lancifolius on cereal germination in vitro.	Water	Aqueous extract	-	The information got after 20 days detected that the aqueous extract of C. lancifolius influenced differently for various crops.	2022
17	To assess the pharma-cognostic effect of C. lancifolius stem comprising macroscopic, microscopic, and chemophysi parameters.	Water, Methanol and Ethyl acetate	Soxhlet apparatus.	Alkaloids, flavonoids, glycoside, steroids and tannins.	The methanolic extract of the stem detect the existence of alkaloids, glycosides, flavonoids, steroids, and other compounds. The ethyl acetate extract appeared the found of steroids and alkaloids, while the aqueous extract contained tannins.	2021
18	Used lancifolamide as an depressant of acetylcholinesterase , herpes simplex virus , and anti-proliferative proteins	Methanol	Extracted with 4 L di-chloromethane with methanol (7 days × 3 times) respectively.	Steroids Cardiac glycosides Anthraquinones saponins and flavonoids.	The active components exhibited cytotoxic effect to murine lymphocytic leukemia, human breast cancer, and normal cells but showed no effects against human colon or lung cancer. It shows potential for Alzheimer's disease, with molecular docking studies suggesting beneficial interactions for neuro-degenerative	2022

					disorders. Additionally, both C. lancifolius extracts and LFD demonstrated antibacterial, antifungal, and antiviral activity, including a 26% inhibition against HSV-1	
19	Screening the pharmacological properties of a novel sulfur-containing compound isolated from Conocarpus lancifolius.	Methanol	-	Saponins Flavonoids anthrax-quinones Steroids and cardiac glycosides	The isolated compound, characterized as lancifoliate, contains flavonoids, saponins, anthraquinones, steroids and cardiac glycosides. It exhibited cytotoxic effect to different cancer cell lines, including human breast cancer and murine lymphocytic leukemia, but no activity against human lung cancer or normal cells. The Minimum Inhibitory Concentration (MIC) against various fungi ranged from 20.2 to 54.5 µg/ml. Molecular docking results confirmed lancifoliate as a more potent antiproliferative agent than ellipticine.	2020
20	In the current study, the C. lancifolius fruits extract was used to generate silver nanoparticles, which were then utilized as antimicrobial and anticancer agents	Deionized water	Boiling at 110 °C for 20 min.	Synthesis of Silver nanoparticles	In vitro, the synthesized materials exhibited antibacterial effect against Streptococcus pneumonia and Staphylococcus aureus, as well as significant activity	2022

					against the fungal pathogens Rhizopus stolonifer and Aspergillus flavus. Additionally, the nanomaterials showed potential anticancer effects.	
21	To detect the active components and assess the antidiabetic effect of Conocarpus lancifolius leaf extracts	Different hydroethanolic extracts	Ultrasonication assisted freeze drying	Total phenolic content antioxidant activity flavonoid contents α-glucosidase and α-amylase inhibitions.	The 60% ethanolic extract showed the largest levels of flavonoids and phenols . At a dose of 450 mg/kg weight of body, the plant extract decreased blood glucose, total cholesterol, LDL, and HDL levels, while increasing hemoglobin in alloxan-induced diabetic mice	2020
22	Inhibition the activity of the COX-1 enzyme that causes pain in thyroid patients by Conocarpus leaves	Water and alcohol	Maceration	Carbohydrates,Tannins ,flavonoids, Saponins, Glycoside ,Terpenoids Coumarins, alkaloids and Phenols.	Both the 10% alcoholic extract and the 10% aqueous extract inhibited COX-1 enzyme activity, with the alcoholic extract showing an 80% inhibition and the aqueous extract showing an 82.3% inhibition.	2024
23	Evaluate the anti-inflammatory, antioxidant and cytotoxic potential of C. lancifolius through in vitro, in vivo, and computational studies.	Dichloromethane and methanol	Maceration	Lancifolian	Lancifolian enhance inflammation reduction, radical scavenging ability, and cytotoxicity, exhibiting cytotoxic activity to four cancer cell lines.	2024
24	Evaluate the antioxidant activity to combination of leaves (Capparis spinosa L.,Conocarpus lancifolius L. and Dodonaea viscosa) in alloxan-induced	Methanol and water	Aqueous extract by maceration, methanolic extract by Soxhlet apparatus	Total phenolic content antioxidant activity	The total phenols in the leaf extract were **15.52 mg/g** in the aqueous extract and **46.97 mg/g** in the methanolic extract. The	2021

	diabetic mice.				antioxidant activity of methanolic extract showed the highest free radical removal activity at **93.28%**, compared to aqueous extract (**86.77%**) at **10 mg/mL**. The synthetic antioxidant **Butylated Hydroxytoluene** exhibited **93.67%** free radical removal activity.	
25	Assess the cardioprotective ,antidepressant, antioxidant, anxiolytic , and memory-enhancing properties of Conocarpus lancifolius leaves.	Aqueous extract	-	Total phenolics , flavonoids in addition, 53 phytocomponents in *Conocarpus lancifolius* leaf aqueous extract.	The in vitro experiments demonstrated strong antiradical effects.The extract also exhibited effective acetylcholinesterase (AChE) inhibition Toxicological tests showed no mortality or clinical toxicity, and the extract effectively decrease iso-induced myocardial injury in rats, improving heart weight, cardiac biomarkers, lipid profile, and histopathological alternation.	2023

Conclusion

The studies on Conocarpus lancifolius have demonstrated its diverse pharmacological and phytochemical potentials. The plant's extracts, obtained using various solvents and extraction methods, contain significant levels of bioactive compounds like phenolics, flavonoids, alkaloids, and saponins. These compounds have shown promising antioxidant, antidiabetic, antibacterial, anti-inflammatory, and anticancer activities. Several studies

highlighted the plant's ability to inhibit enzymes such as α-amylase, acetylcholinesterase, and COX-1, making it a candidate for treating diseases like diabetes, Alzheimer's, and chronic pain. Moreover, C. lancifolius extracts exhibited low toxicity, indicating their safety for therapeutic use. This plant is also valuable in drug development, as its bioactive compounds can be utilized to formulate novel pharmaceuticals targeting various health conditions.

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