International Journal of Pharmacognosy and Herbal Drug Technology (IJPHDT)
ISSN:3049-1630, Vol.02, Issue No.09,2025(pp.94-103)
AKT PUBLICATION
ORIGINALARTICLE https://www.aktpublication.com/index.php/ijphdt

Phytochemical and Antifungal Investigation of The Plant of "*Caryota Urens*"

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ABSTRACT

The present study evaluated the antifungal potential of methanolic bark and leaf extracts of *Caryota urens* (family: Arecaceae), a palm species traditionally used in folk medicine. Extracts were prepared and screened against *Trichoderma asperellum* using the disc diffusion method, with Amphotericin B (180 µg/disc) serving as the positive control. Preliminary phytochemical analysis revealed the presence of flavonoids, alkaloids, tannins, phenols, and saponins, compounds known for their antimicrobial properties. Both extracts exhibited moderate antifungal activity in a dose-dependent manner. At 1000 µg/disc, the leaf extract produced an inhibition zone of 7 mm, whereas the bark extract showed stronger activity with zones of 9–10 mm. In comparison, Amphotericin B produced a 10 mm inhibition zone at a lower concentration, confirming its higher potency. These findings suggest that *C. urens* possesses bioactive constituents with antifungal activity, particularly in the bark, and highlight its potential as a natural source for the development of novel antifungal agents.

Key Words:

Antifungal, Antimicrobial, *Caryota Urens,* Phytochemical Analysis, *T.Asperellum.*

Article History:

Received Aug. 22, 2025

Revised Sep. 12, 2025

Accepted Sep.26, 2025

Published Sep.29, 2025

DOI: https://doi.org/10.64063/3049-1630.vol.2.issue9.8

1. INTRODUCTION

Caryota urens is a native rainforest species from tropical. The *Caryota urens* is a member of the family Arecaceae. It is known as Sulphi in the Baster region of Chhattisgarh State. It is one of the most popular trees that are traditionally tapped for sap to make sweet syrup, sugar, and alcoholic beverages [1.] Natural bioactive substances called phytochemical are present in plants and plant parts such as fruits, bark, flowers, leaves, and roots. They combine with fibers to function as a defense mechanism against illnesses as well as to avoid illnesses [2.] The medicinal

and nutritional benefits of palm species are widely recognized, as are the heartwoods, spadix, sap, coat, seed, fiber, endocarp, fruits, branches, roots, bark, and leaves. They are also used to make wine because of their sweet flavor. A rich source of starch, the trunk has long been used to make flour in Bangladesh, China, India, and Theban. It has numerous medicinal uses, including treating parasite infections, kidney damage, diabetes, arthritis, and more [3.] According to traditional knowledge, Caryota urens inflorescence sap and products made from it have health-promoting qualities and are utilized in Sri Lanka's ayurvedic medical system. Analysis of C. urens sap and sap-based products has been the subject of numerous studies. Free radicals are molecules or molecular fragments that contribute to the pathophysiology of some human diseases because they contain one or more unpaired electrons Including aging, atherosclerosis, cancer, Parkinson's disease, Alzheimer's disease, and Down syndrome [4.]

(a) Tree [16] **(b) Leaf [17]** **(c) Bark [18]**

- **Taxonomical Classification**

Botanical name	***Caryota urens L.***
Kingdome	Plantae
Phylum	Spermatophyta
Class	Monocotyledon
Order	Arecales
Family	Arecaceae
Genus	Caryota
Species	*Caryota urens L*

Taxonomical classification is presented in Table 1.

- **Local Names:**

Chattisgarh: Sulfi

Tamil: Kondapanei
Malayalam: Chuntappana
Sanskrit: Moha-karin
Hindi: Mari
Gujarati: Shivjata

English: Fishtail palm
Telugu: Jeelugu
Marathi: Bherlimaad
Kannada: Bagani

- **Botanical Description**

Caryota urens is a tall and attractive palm that can grow up to 22 meters high with a trunk about 2.8 meters thick. The trunk of the Caryota urens gives about 100–150 kg of pith, which is used to make flour. Its straight trunk is smooth and marked with ring-like lines. The leaves are triangular, shaped like a fishtail. When the tree matures, it produces clusters of small white male and female flowers. The fruits are round, about 1 cm in size, and turn red when ripe[5]. The leaves of the Caryota urens can grow up to 7–8 meters long. The fishtail palm gets its name because its leaflets look like a fish's tail. There leaves are often used for roofing huts, and they can also be made into strong ropes [6]. The kithul palm has a spadix inflorescence about 3 meters long that hangs loosely around the tree. Each inflorescence stays open for about six weeks and produces clusters of white, single-sex flowers, which can give 35,000–40,000 seeds [7].Kithul seeds have an endosperm, which is covered by a hard inner layer (endocarp), a fleshy middle layer (mesocarp), and a smooth outer layer (epicarp). The embryo is found at one end of the endosperm[8].The bark is actually the outer surface of the stem of the palm. Composed of fibrous vascular bundles scattered in a ground tissue matrix. Provide mechanical support to the tall palm. The bark is smooth, gray to brown in color. Root are numerous, cylindrical, and unbranched or sparsely branched. Mostly uniform, ranging between a few millimeters to 1-2 cm in thickness.

- **Geographical Description**

Caryota urens L. (commonly known as the fishtail palm or Kithul) is a tall palm species native to the tropical regions of South and Southeast Asia. It grows naturally in the lowland and montane rainforests **of** India, Sri Lanka, Myanmar, Malaysia, Indonesia, and the Philippines. In India, it is commonly found in the Western Ghats, Eastern Ghats, and parts of the northeastern states**,** usually thriving at elevations up to 1,500 meters [9].

2. METHOD AND MATERIAL

2.1 Plant collection And Authentication

Caryota urens leaves and bark are collected in Kanker Chhattisgarh, and identification and authentication processes carried out by botanists associated with department of Government V.Y.T.PG Autonomous College, Durg (C.G.).

2.2 Instrument

UV-Spectroscopy (UV-1780, Shimadzu Scientific Instruments, Inc. USA), Soxhlet apparatus, Water bath.

2.3 Chemicals

Methanol, ethanol, dragendroff reagent, Mayer's reagent, molish reagent, ferric chloride, glacial acetic acid, H2SO4, hydrozyanthroquinone, chloroform, amphotericin B (amphorae), dimethyl sulfoxide (DMSO), Cyclohexane, petroleum ether.

2.4 Removal of chlorophyll from leaf using petroleum ether

Place the powdered leaf sample into a conical flask. Add 120ml of petroleum ether and add 80ml of water (enough to cover the powder). Close the flask and keep it in a water bath at 50-60°C. Shake gently at intervals for uniform mixing. Petroleum ether layer will gradually turn green as chlorophyll dissolves.

Allow the mixture to stand until two clear layers from:

- Upper layer (petroleum ether phase): green, containing chlorophyll and other non-polar pigments.
- Lower layer (aqueous phase): mostly water and polar compound.

2.5 Plant Extraction

Collect Caryota urens leaves and bark were shade dried for a weeks. After shad drying, the samples were ground into a fine powder using an electrical blander. 50g of sample was extracted with 500 ml of methanol using soxhlet apparatus. For extraction, the powdered material was uniformly packed in a Soxhlet extractor. A thermostat-controlled electric heating mantle was used to regulate the temperature. The extraction process was considered to have ended when the colourless solvent in the siphon tube appeared. After filtering, the extract was dried out in a rotavapor at a regulated temperature and lower pressure[10.]

2.6 Phytochemical test

A phytochemical test is an analytical procedure employed to identify the presence of secondary metabolites in plants. These metabolites, including alkaloids, flavonoids, tannins, saponins, phenolic compound, carbohydrate and glycosides**,** are bioactive constituents that contribute significantly to the therapeutic efficacy and pharmacological potential of medicinal plants[11.]

2.7 UV-Spectrophotometric analysis

The ethanolic extracts of *Caryota urens* bark and leaves were analyzed for the presence of secondary metabolites using a UV-1650 Shimadzu spectrophotometer, with the wavelength range set between 200–400 nm[5.]

2.8 Anti-microbial activity assay

The Antifungal activity was checked by following Zone Inhibition Method (Kirby Bauer method). The SDA plates were inoculated by spreading with 5 µl of Fungal culture, Trichoderma asperellum (Inoculum was prepared by adjusting 0.5 McFarland Unit - Approx cell density (1.5 X 108 CFU/mL from Sabouraud dextrose broth) and followed by placing the discs containing 5 µl of different concentration (0 to 200 mg/ml). One disc in each plate was loaded with solvent alone which served as vehicle control and Amphotericin B disc (180 µg) was taken as positive control. The plates of *Trichoderma asperellum* were incubated (Basil Scientific Corp. India-Incubator) at 37 °C for 48 hrs. The clear zones created around the disc were measured and recorded [12, 13, 14, 15.]

3 RESULTS AND DISCUSION

3.1 Phytochemical screening

The elementary screenings of chemical compound produced by methanolic extract was chemically tested using standard method. The chemical test indicating that the presence of alkaloids, tannins, saponins, phenols, carbohydrates, flavonoids, glycosides on methanolic extract of *Caryota urens*

The result are presented in Table 2

SN.	TEST NAME	LEAF	BARK
1	Alkaloids		
	Mayer test (a	+	+
	Wagner test (b	+	+
2	Flavonoids		
	Alkaline reagent test (a	+	+
	Lead acetate test (b	+	+
3	Carbohydrate		
	Molish test (a	-	-
	Benedict test (b	-	-
4	Glycoside		
	Borntrager test (a	+	+
	Salkowski,s test (b	+	+
5	Phenolic compound		
	Ferric chloride (a	+	+
6	Tannins		
	Ferric chloride (a	+	+
7	Saponins	+	+

3.2 UV-VIS spectral analysis

1 Leaf: The ethanolic leaf extract of *Caryota urens* was subjected to UV-Vis spectroscopic analysis, which exhibited characteristic absorption peaks at 209.7 nm, 270.3 nm, 328.3 nm, and 331.4 nm with corresponding absorbance values of 1.719, 0.531, 0.529, and 0.526, respectively. These spectral peaks confirm the presence of oxalic acid, phenolic compounds, flavonoids, and terpenoids within the extract.

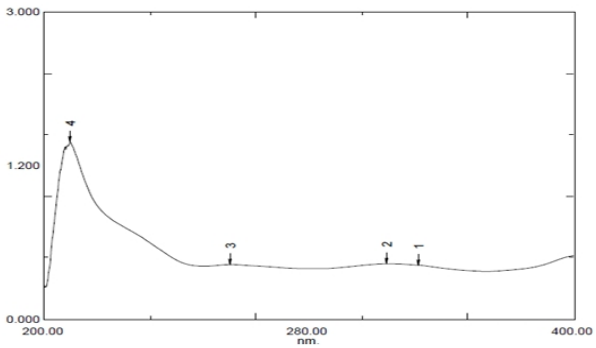


Figure no.1 UV spectrum of Caryota urens methanol leaf extract

2 Bark: The ethanolic leaf extract of *Caryota urens* was subjected to UV-Vis spectroscopic analysis, which exhibited characteristic absorption peaks at 207 nm, 282.80 nm, 312 nm, and 320.80 nm with corresponding absorbance values of 1.276, 0.859, 1.356 and 1.368 respectively. These spectral peaks confirm the presence of oxalic acid, phenolic compounds, flavonoids, and terpenoids within the extract.

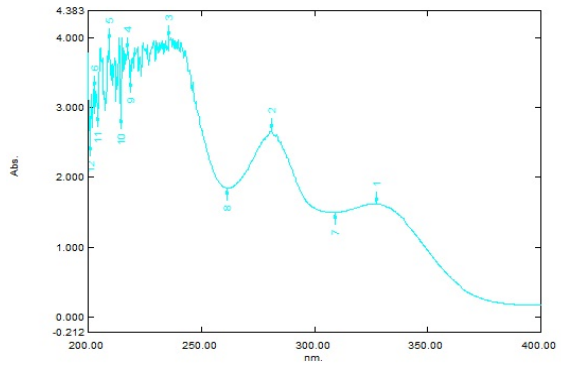


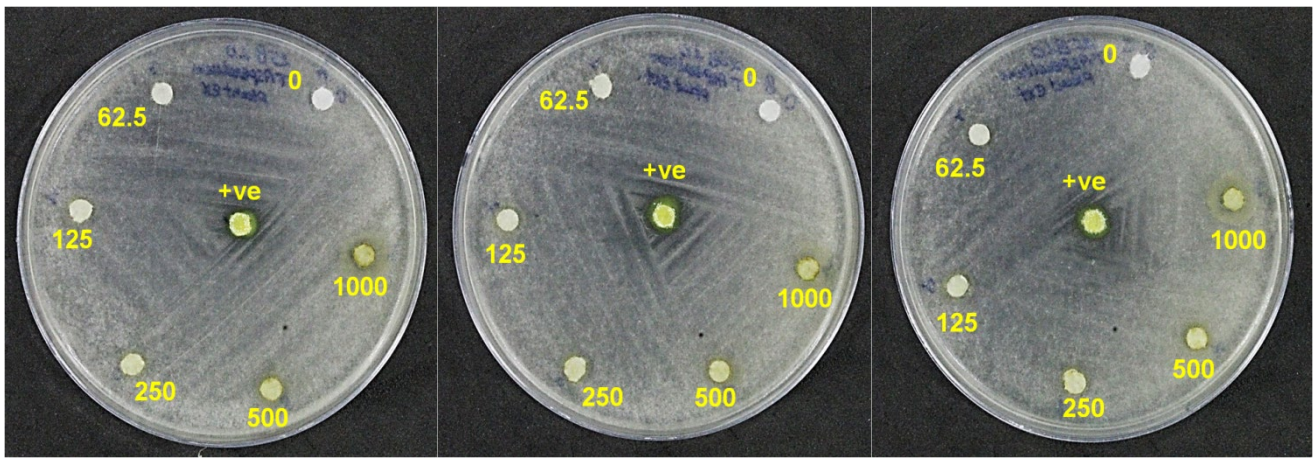
Figure no. 2 UV spectrum of Caryota urens methanol bark extract

3.3 Antifungal activity

1 Leaf: The antifungal activity of methanol leaf extract of Caryota urens show the effective inhibition against *Trichoderma asperellum* (6mm).The result are represented in Table 3

Amount (µg/disc)	Plate A	Plate B	Plate C	Average	SD	SEM
PC	10	10	10	10	0	0
0	0	0	0	0	0	0
62.5	0	0	0	0	0	0
125	0	0	0	0	0	0
250	6	6	6	6	0	0
500	6	6	6	6	0	0
1000	7	7	7	7	0	0

Table no. 3 Antifungal activity- *T asperellum* - Leaf extract



A **B** **C**

Figure no. 3

Amount present per disc in µg

Dispensed Volume- 5 µl
Positive Control (Amphotericin B) - 180 µg

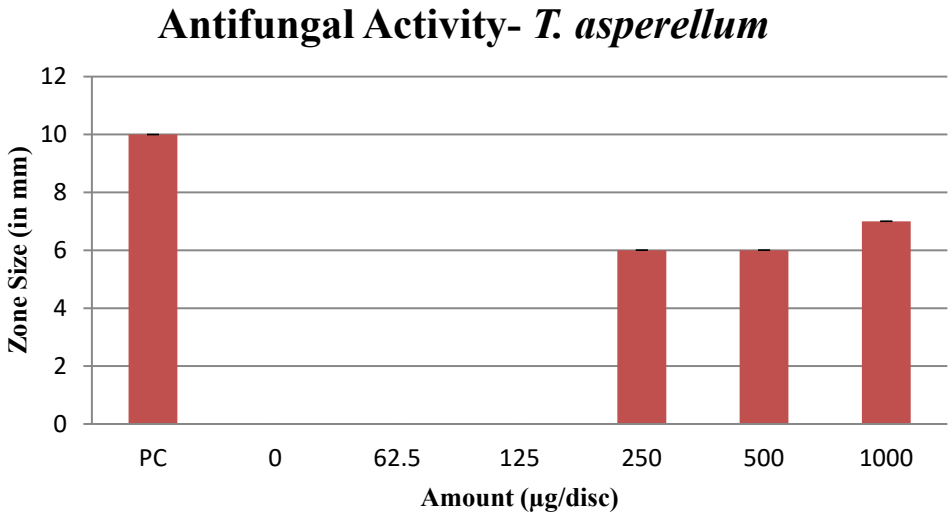
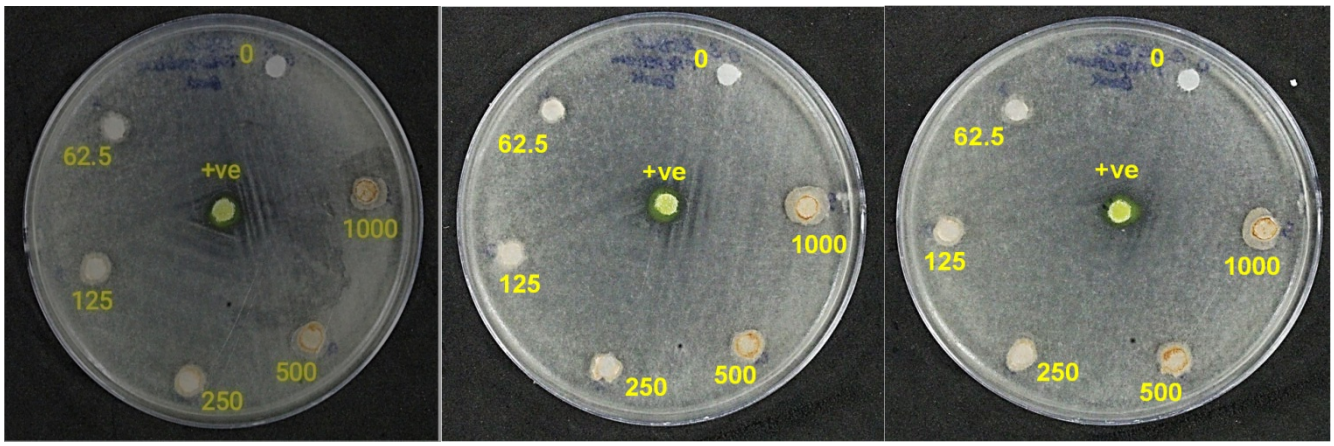


Figure no.4 Antifungal activity of *C.urens* Leaf

2 Bark: The antifungal activity of methanol bark extract of *Caryota urens* show the effective inhibition against *Trichoderma asperellum* (6mm).The result are represented in Table 4

Amount (µg/disc)	Plate A	Plate B	Plate C	Average	SD	SEM
PC	10	10	10	10	0	0
0	0	0	0	0	0	0
62.5	0	0	0	0	0	0
125	0	0	0	0	0	0
250	6	6	6	6	0	0
500	7	7	7	7	0	0
1000	9	10	10	9.66666667	0.5773503	0.33333

Table no. 4 Antifungal activity- *T asperellum* - Bark extract



Figur no.5 A B C
Amount present per disc in µg
Dispensed Volume- 5 µl,
Positive Control (Amphotericin B) - 180 µg

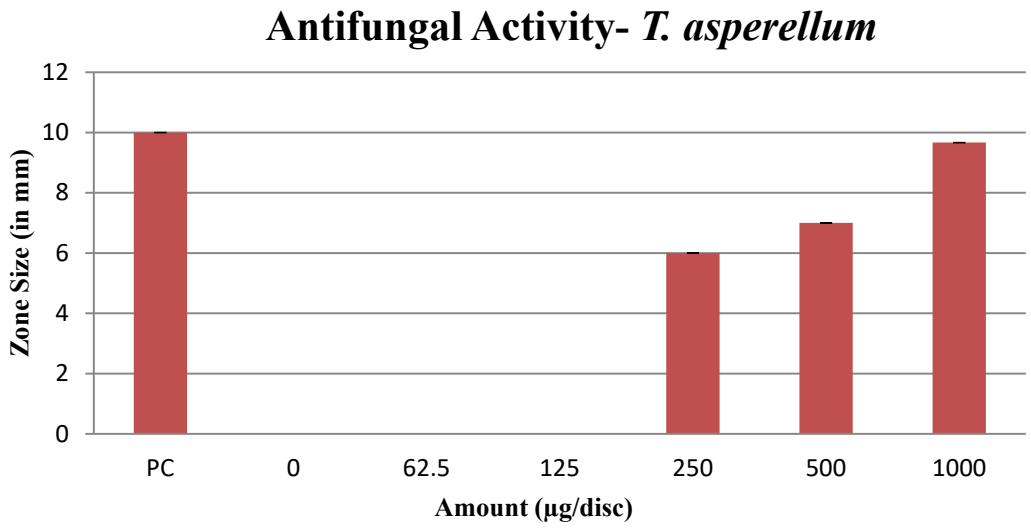


Figure no.5 Antifungal activity of *C.urens* Bark

For *T. asperellum*, Amphotericin B (positive control) produced a clear zone of inhibition of 10 mm at 180 µg/disc, confirming the validity of the assay. In comparison, leaf at 250 µg/disc produced a 6 mm inhibition zone, while bark at the same concentration also produced a 6 mm zone (Table5). At higher concentrations (500 and 1000 µg/disc), leaf maintained inhibition zones of 6–7 mm, indicating a dose-dependent but relatively weaker activity compared to the standard drug. Bark displayed comparable inhibition but without significant improvement beyond 250 µg/disc, suggesting a plateau effect in its activity. Based on the results obtained from this study, samples- leaf and bark were found effective at the amount mentioned in the below table-5

S. No.	Sample Id	Effective Amount	Average Zone at Effective Amount (in mm)
1	Amphotericin B(PC)	180 µg	10
2	Leaf	250 µg	6
3	Bark	250 µg	6

Table no. 5 Effective amount of leaf and bark

- **Observation from Plate**

1. The positive control (+ve, Amphotericin B) at the center shows a strong clear zone of inhibition, confirming the assay validity.
2. At increasing concentrations of the extract (62.5, 125, 250, 500, and 1000 µg/disc), visible zones of inhibition are formed around the discs.
3. The inhibition is dose-dependent: smaller zones at lower concentrations (62.5–125 µg), while larger and clearer zones appear at higher concentrations (500–1000 µg).
4. The negative control (0 µg/disc**)** shows no inhibition, confirming that the activity is due to the extract and not the solvent.

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