



Original Review Paper

“Ethnopharmacological Relevance of *Apama siliquosa*: Phytochemistry and Emerging Pharmacological Evidence”

Dibinlal D¹ Dr. Phool Singh Yaduvanshi² Dr. Kavita Loksh³ Dr. Samisha Sharma

¹ Research Scholar, Department of Pharmacognosy, IES Institute of Pharmacy, IES University, Bhopal (M.P.) India

² Professor, Department of Pharmacognosy, IES Institute of Pharmacy, IES University, Bhopal (M.P.) India

³ Principal, IES Institute of Pharmacy, IES University, Bhopal (M.P.) India

⁴ Associate Professor, Department of Pharmaceutics, IES Institute of Pharmacy, IES University, Bhopal (M.P.) India

Abstract

Medicinal plants have gained worldwide attention due to their concealed healing potential. *Apama siliquosa* Lam, belongs to Aristolochiaceae family, is native to India and Srilanka. Traditionally, plant has been utilized for a wide variety of human ailments, including snake bites and skin disease. This article brings together ethnomedicinal, phytochemistry, and reported pharmacological activities of *Apama siliquosa*. The following keywords were used to search the pubmed and Google Scholar databases: "*Thottea siliquosa* or *Apama siliquosa*". To find relevant papers, the results were examined. From current ethnopharmacological sources, data from relevant chosen studies was methodically examined, compared to scientific literature, and then extracted. Limited articles were found through a literature search, they were examined further and showed that *Apama siliquosa* has interesting biological activities, such as antioxidant, anticancer, anti-inflammatory, and antibacterial properties. There are no clinical studies on *Apama siliquosa* to date. Although there is a wealth of ethnomedical knowledge underlying the traditional use of *Apama siliquosa*, there is currently little scientific proof to back up these assertions. Increasing our knowledge of the biological functions of this plant is the first step towards further study that is required to substantiate these medical claims.

Key words : *Apama siliquosa* Lam, *Thottea siliquosa*, Review

1. Introduction

Herbal remedies have played a significant part in human health for thousands of years. A variety of highly valuable medicinal natural products from herbal medicine have been extracted through recent scientific advancements. These products are rich and distinct in terms of their structural skeleton and stereochemistry, enabling the treatment of a wide range of diseases, the regulation of physiological processes, and the efficient combination of drug targets (Guo et al., 2024). Natural products will be essential in meeting this demand through ongoing research into the world's biodiversity, most of which is yet unknown (Chaachouay & Zidane, 2024). When COVID-19 first appeared in late 2019, it quickly swept throughout the world. Natural products like terpenoids, alkaloids, and chemicals that target viral proteins and enzymes exhibit great anti-coronavirus potential, making them prospective preventive and therapeutic agents, natural ingredients such as *Allium sativum*, *Camellia sinensis*, *Zingiber officinale*, and *Nigella sativa* also increase immunity (Boozari & Hosseinzadeh, 2021). Given its abundance of herbal medicine, the Indian subcontinent is efficient to handle the challenge of satisfying the global demand

for such goods. In the past, Indians have traditionally been essential to the creation and administration of these biological resources. They have also preserved their relevant data, which has been gathered through centuries of trial and error (Saggar et al., 2022).

The shrub *Apama siliquosa* (L.), or *Thottea siliquosa* which is a member of the Aristolochiaceae family, grows in the evergreen forests of the Western Ghats, extending from Kerala to the Konkan (Jose et al., 2021).



*Corresponding Author:

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Figure 1. *Apama siliquosa* entire plant
Figure 2. *Apama siliquosa* root

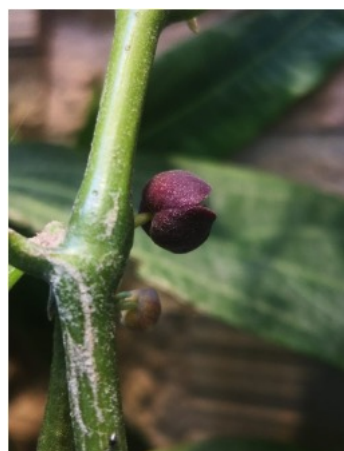


Figure 3. *Apama siliquosa* Stem and Flower

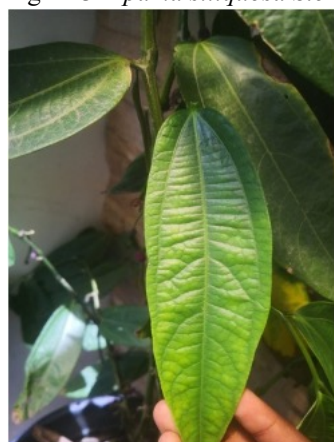


Figure 4. Leaf

The plant has traditionally used for the various diseases like snake bites and skin diseases. The plants found to contain alkaloids, glycosides, and carbohydrates. Based on the previous studies the plant has shown to possess different pharmacological activities like antioxidant, antibacterial, anticancer, and anti-inflammatory properties. Literature from a variety of computerized databases (including Pubmed and Google Scholar) up to 2025 was searched in order to conduct a thorough and methodical review.

The terms "*Apama siliquosa*" and "*Thottea siliquosa*" were utilized. To find pertinent articles, the results were examined. The existing scientific literature and the ethnopharmacological data were also compared using current knowledge sources. Data was methodically gathered from the chosen studies.

2. Ethnomedicinal uses

Traditionally, *Apama siliquosa* is used in the various diseases by the tribes of Western Ghats. The people of the Papanasam forest range, Tamilnadu uses the root bark of the *Apama siliquosa* in skin diseases. The root bark paste is applied to cuts and wounds to stop the bleeding to promote healing. Further, it serves as a remedy for insect stings, including those of centipedes, spiders, and scorpions. Root paste is applied to the site of the bite or sting and securely wrapped in all types of snake bites. At the same time, it is administered internally as well. Additionally, it is used as a general tonic to increase immunity and relieve headaches, chest pains, and stomachaches (Chelladurai & Apparathanam, 1983). Ayurvedic doctors in the Konkan and Malnad districts of Karnataka use the mature roots of *A. siliquosa* to treat dysentery. The roots are ground into a paste with lemon juice (60 grams in 14 milliliters) and taken orally every 15 minutes. The roots are also said to be effective in cholera, and an ointment made from the plant is said to be helpful in treating carbuncles and inveterate ulcers. It is considered to be one of the most potent poison counteracting snakebite (Mary et al., 1977). *Apama siliquosa* is a traditional remedy for diarrhea (Poornima et al., 2019).

Fresh roots of *Thottea siliquosa* are combined with fresh toddy sourced from the inflorescence of *Arenga wightii* Griff. and left overnight. To avoid foetal malformation, a small quantity of toddy is administered to pregnant ladies each morning (Malampandaram) among the tribes of Periyar Tiger Reserve, Western Ghats (Augustine et al., 2010). Root as antidote for poison and food poisoning by the people of Kumar parvatha Kukke Subramanya, Mangalore, Karnataka (Shiddamallayya et al., 2010). The roots have been used since ancient times in treating diarrhea and dysentery in the indigenous system of medicine (Agrawal & Laddha, 2017). For vomiting and dysentery, roots of *Thottea siliquosa* are ground in rice-washed water, mixed with lemon juice, and administered orally once daily for two days (Shivanna & Rajakumar 2011). 10 gm of the paste with self urine is used for the snake bite by Kani Tribes (Vanam, 2007). It also effective in stomach worms (Sreejit & Thomas, 2017). The root with rice wash is made into a paste and applied for oedema. The leaf juice with lime is an antidote for bee stings. The plant is used to treat stomach ache, chest pain,

and skin disorders by Kani tribes of Agasthiyarmalai biosphere reserve, southern Western Ghats (John, 1984).

3. Phytoconstituents

In a preliminary phytochemical analysis of the root extract showed the presence of alkaloids, carbohydrates, tannins, phenols and glycosides (Poornima, et al., 2019; Raju & Ramesh, 2012). The FTIR spectrum of the *Thottea siliquosa* displays 15 prominent peaks ranging from 3422.70 to 469.90 cm⁻¹. The recorded peaks confirm the existence of several functional groups, including phenols, alkanes, carboxylic acids, nitro compounds (oximes and lactams), ketones, ethers, and halogen derivatives (chloro and bromo compounds) (Shalini, 2018). Aristolochic acid from *Aristolochia indica* stem and *Apama siliquosa* root was isolated and quantified using solvent extraction and recrystallization (Agrawal et al., 2017). The plant found to contain an alkaloid, chakranine (Vaz & Fernandes, 1958). GCMS analysis of the methanolic extract of the root revealed caryophyllene oxide, methyl ester of aristolochic acid I, and aristolactam I–III; aristolactam I–II was exhibited by the aqueous extract. Caryophyllene oxide belongs to the class of terpenes, while aristolochic acids are classified as alkaloids (Jose et al., 2021). GCMS of the leaf oils from *T. siliquosa* have been characterized by the presence of major compounds such as bicyclogermacrene (18.4%), spathulenol (9.3%), and trans- β -ocimene (6.7%). (John et al., 2008).

4. Pharmacological activities

Antioxidant activity

Silver nanoparticles (15 to 34 nm) of *Thottea siliquosa* methanolic leaf extract showed significant antioxidant capacity through peroxide scavenging activity (116.27 μ g/mL), DPPH radical scavenging (132.7 μ g/mL), and ABTS radical scavenging (106.0 μ g/mL). These findings imply that plant has potential as a strong antioxidant agent since it can efficiently neutralize many kinds of free radicals (Renny et al., 2025). Petroleum ether, chloroform, and ethyl acetate extract of the leaves of *Apama siliquosa* has shown *in vitro* antioxidant activity through the ammonium thiocyanate assay and DPPH assay (Thirugnanasampandan et al., 2008). TLC, HPLC, and UV-VIS investigations revealed the presence of alkaloids, tannins, phenols, and other chemicals in the methanolic extract of *Thottea siliquosa* Lam. roots. The DPPH experiment showed that the extract has high antioxidant and free radical scavenging activity (Raju & Ramesh, 2012). Methanolic extract of *Thottea siliquosa* has strong antioxidant activity, as evidenced by its capability to scavenge DPPH radicals (110.40 $\pm$ 4.5 μ g/mL), ferric reducing antioxidant power (FRAP) (41.1 $\pm$ 6.2), and

peroxides (233.4 $\pm$ 14.2 μ g/mL) (Koottasseri, et al, 2020). Petroleum ether and ethyl acetate extracts from the roots and leaves of *Thottea siliquosa* showed the presence of alkaloids, tannins, glycosides, coumarins, flavonoids, and saponins. Phenol levels ranged from 2.5 to 4.8 mg/g, while alkaloid levels were between 43 and 287 μ g/g and saponin levels ranged from 66 to 303 μ g/g. They exhibited significant DPPH, hydroxyl, superoxide, and nitric oxide quenching activities, with IC₅₀ values similar to those of ascorbate and BHT, and inhibited lipid peroxidation, indicating strong antioxidant properties (Saiba et al., 2013).

Anticancer activity

Aqueous root extract of *Thottea siliquosa* act as a natural CDK4/6 inhibitor. Bioactive compounds were identified by GC-MS, and molecular docking revealed that isocorydine and thunbergol had binding affinities similar to those of Palbociclib and Ribociclib. 2-palmitoylglycerol and squalene exhibited moderate activity. The ADME analysis showed that the drug had favorable properties. The extract showed cytotoxicity that depended on the dose (IC₅₀ = 140 μ g/mL) and decreased HCT116 cell migration, indicating possible anti-proliferative effects. The results suggest that *T. siliquosa* root extract is a promising plant-derived candidate for CDK4/6-related cancers (Elakkiya et al., 2025). Inhibiting the growth of breast cancer cell lines MCF7 (IC₅₀: 3.02 μ g/mL), MDAMB231 (IC₅₀: 5.41 μ g/mL), and the colorectal cancer cell line HCT15 (IC₅₀: 6.07 μ g/mL), the synthesized silver nanoparticles from the plant demonstrated remarkable cytotoxicity against multiple cancer cell lines, highlighting plant's potential as an effective anticancer agent targeting various cancer types (Renny et al., 2025). The methanolic root extract of *Thottea siliquosa* demonstrated potent cytotoxicity against K562 cancer cells. Alkaloids, tannins, and phenols were identified through phytochemical screening, suggesting anticancer potential (Raju & Ramesh, 2012). Methanolic and aqueous extracts of roots were evaluated using the brine shrimp lethality assay and the MTT assay on MCF7 cells. LC₅₀ values: aqueous 102.32 μ g/ml & 117.527 μ g/ml, methanolic 91.20 μ g/ml & 87.4056 μ g/ml (brine shrimp & MTT respectively). Both extracts demonstrated excellent toxicity to naupli while exhibiting mild toxicity to cell lines (Jose et al., 2021). The methanolic extract *Thottea siliquosa* roots exhibited significant cytotoxic effects against the K562 cell line, indicating potent anticancer activity (Raju & Ramesh, 2012).

Bioactive chemicals with the ability to inhibit cancer targets like EGFR, VEGFR, and GST were discovered using LCMS and *in silico* investigation of

Thottea siliquosa. As demonstrated by elevated production of caspase and APAF-1, the anticancer actions against human endometrial and breast cancer cells were mediated by apoptosis. This implies that *T. siliquosa* is a viable source for additional bioactive chemical separation that has anticancer properties (Kootasseri et al., 2011). Human breast and endometrial cancer cells have shown antitumor activity against the methanolic extract. The precise bioactive substances causing these effects may be isolated and identified with the aid of more research and bioassay-guided fractionation (Kootasseri et al., 2020).

Anti-inflammatory activity

The plant's root extract has been shown *in vitro* to have anti-inflammatory properties by inhibiting heat-induced hemolysis and albumin denaturation. For these activities, the extract's IC₅₀ values were 39.5 µg/ml and 36.30 µg/ml, respectively (Jose et al., 2021). The inflammatory enzymes lipoxygenase and COX-2 may be inhibited by the bioactive substances found in *Thottea siliquosa*. This suggests that the plant's chemicals have intriguing anti-inflammatory properties (Kootasseri et al., 2021). Nitric oxide radical scavenging (28.76 ± 3.9 µg/mL) and lipoxygenase inhibition experiments (39.2 ± 3.2 µg/mL) demonstrate the extract's strong anti-inflammatory properties (Kootasseri et al., 2020). Anti-Inflammatory effects of *Thottea siliquosa* methanol leaf extract (TSE) in mice tested with carrageenan- and formalin-induced paw oedema models. TSE diminished oedema by as much as $60.0 \pm 1.8\%$ in the carrageenan model and reduced paw thickness by as much as $64.72 \pm 2.2\%$ in the formalin model. Numerous bioactive substances were detected by LC-MS, indicating that their combined action is responsible for the effects (Renny et al., 2024). Through the inhibition of lipopolysaccharide (LPS)-induced cytokine production in Raw 264.7 macrophages, nanoparticles from the plant demonstrated notable anti-inflammatory benefits. This suppression suggests that the nanoparticles can control inflammatory reactions, which may help lessen diseases and harm brought on by inflammation (Renny et al., 2025). Methanol extract of *Thottea siliquosa* had a significant effect on the LPS-induced release of IL-1 β , IL-6, and TNF- α ($p < 0.05$) and on the expression of TLR4 and NF- κ B genes. It was non-toxic to onion root cells and alleviated EMS-induced genotoxicity. These results indicate that TSM may serve as a promising anti-inflammatory and anti-genotoxic agent (Tom et al., 2022). Root extracts obtained with chloroform, ethyl acetate, 70% ethanol, methanol, and water were evaluated using albumin denaturation, anti-protease, HRBC membrane stabilization, and COX/LOX assays in

RAW 264.7 cells. The chloroform extract demonstrated the greatest anti-inflammatory activity, whereas the aqueous extract showed effects that depended on the dosage (Athira et al., 2012).

Antidiabetic activity

Through glucose diffusion inhibitory tests and alpha-amylase inhibition experiments, the *T. siliquosa* extract shown *in vitro* anti-diabetic action. It demonstrated a substantial inhibition of glucose diffusion across the dialysis membrane and produced an IC₅₀ value of 15.75 µg/ml for alpha-amylase inhibition (Jose et al., 2021).

Antibacterial activity

The leaf and root extracts of *T. siliquosa*, obtained using methanol and ethyl acetate, are promising natural sources of antioxidants and bactericidal agents (Nusaiba & Murugan, 2013). Notable antimicrobial qualities were demonstrated by nanoparticles. This implies that the silver nanoparticles made from the leaf extract of *T. siliquosa* may be effective against bacterial infections as a broad-spectrum antibacterial agent (Renny et al., 2025). The leaf oils from two *Thottea* species, namely Descriptions of *T. siliquosa* and *T. sivarajani* exhibited moderate inhibitory effects on the Gram-positive and Gram-negative bacteria that were tested (John et al., 2008). Petroleum ether and ethyl acetate extracts of *Thottea siliquosa* showed strong antibacterial activity, particularly against *B. subtilis*, *B. cereus*, *S. aureus*, *K. pneumoniae*, *P. aeruginosa*, *E. coli*, and *S. epidermidis*, with most other bacteria and fungi resistant except *Candida albicans*. Phytochemical analysis revealed high phenols, saponins, and alkaloids, and results were supported by MIC, MBC/MFC, time-kill, and spore germination assays (Saiba et al., 2013).

5. Conclusion

According to reports, *Apama siliquosa* has long been used to treat a variety of illnesses, including skin disorders and snake bites. The most commonly reported chemical compound is aristolochic acid. Numerous biological activities, including as antibacterial, anti-inflammatory, anticancer, antidiabetic, and antioxidant properties, were demonstrated by the plant extracts. Pharmacological tests no longer support a number of traditional uses. In the same way, only a small number of investigations were devoted to the *in vitro* assessment of bioactivities, and no therapeutic study with human and animal models. These results imply that the extract and isolated chemicals should be properly evaluated in human and animal models in order to investigate their mechanism of action and enhance optimism regarding their safety profile.

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Author contribution

Dibinlal D: Writing – original draft, Validation, Data curation, Conceptualization. **Kavita**

Loksh: Methodology, Formal analysis, Data curation, **Phool Singh Yaduvanshi:** Formal analysis, Data curation, Conceptualization. **Samisha Sharma** : Reaearch analysis, Conceptualization

Conflict of interest

None

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