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TRADITIONAL KNOWLEDGE AND MODERN PERSPECTIVES ON *CARALLIA BRACHIATA*: AN EMERGING MEDICINAL TREE

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ABSTRACT

People have used many plants as a traditional medicine for a long time. The widespread consensus is that the plantspecies continue to provide several unidentified benefits. Traditionally, various parts of this plant have been used in folk medicine, and recent phytochemical investigations suggest the presence of bioactive compounds with antioxidant, antimicrobial and cytoprotective properties. This review examines the ethnomedicinal uses of *C. brachiata*, highlighting its importance in traditional treatments for a range of illnesses. Many of these research focus on the potential uses of *C. brachiata* as an anticancer, antitumor, anti-inflammatory, antifungal, antibacterial, antiviral, and antidiabetic agent. Studies have indicated that the species does present numerous benefits and untapped possibilities in the medicinal field. The therapeutic potential of the plant is further highlighted by discussing current pharmacological research. This review summarizes its taxonomy, distribution, phytochemistry, pharmacological potential and future research prospects. This article will also look at the significance and current state of *C. brachiata* globally. From review it is recommended that, further research is needed to fully understand the mechanisms of action and potential therapeutic applications of this plant.

Keywords: *Carallia Brachiata, Ethnomedicinal, Anti-Inflammatory, Antidiabetic Etc.*

1. INTRODUCTION

Carallia brachiata (Lour.) Merr. (Rhizophoraceae) commonly known as freshwater mangrove has various ethnomedicinal uses, particularly in traditional medicine systems across different regions. *C. brachiata* is a small to medium-sized evergreen ornamental tree which grows up to 20 m in height and widely distributed in India. The occurrence of species along the west coast was reported by Chavan (2013). Medicinal plants are a rich source of novel therapeutic agents and *C. brachiata* is an underexplored species with considerable potential. Although primarily known as a shade and ornamental tree, increasing attention is being given to its role in traditional medicine, especially in South and Southeast Asia. Traditional practices utilize various parts of the plant, including the leaves, bark, and fruit, for treating a range of ailments.

Uses of bark:

Bark of *C. brachiata* is traditionally used in wound healing, treating itch, oral ulcer, inflammation of throat and stomatitis (Nadkarni and Nadkarni, 1995). The ethyl acetate and methanol extracts of bark exhibited anti-inflammatory and wound healing activities.

The leaves and bark are used medicinally against itch and septic poisoning. Marori tribe used this plant as a traditional medicine. Document of ethnomedicinal survey of Marori tribes showed that leaves or stem bark of *C. brachiata* was used to treat dysentery or hematuria (Krishnaveni *et al;* 2009a). In traditional Thai medicine, *C. brachiata* stem and bark are used for antipyretic treatment (Krishnaveni *et al;* 2009b). In addition, various parts of *C. brachiata* had been used to treat various human clutters in India (Junejo, 2013).

The fruits and seeds of this plant are edible. The seed oil is also used as a substitute for ghee in several parts of India. In traditional medicine, various parts of *C. brachiata* are used for treating various human disorders. The juice from the macerated leaves is used in the treatment of fevers. The pulverized bark is rubbed on the body in the treatment of smallpox. The leaves and bark are used in local medicine to treat septic poisoning and itch. Additionally, it is used for treating mouth ulcers, tongue sores, sore throats, and even malaria in some areas. The plant is also known for its chemical constituents, including proanthocyanidins, which have been shown to possess free radical scavenging activity. Some of these compounds, such as carallidin, mahuanin, and para-hydroxy benzoic acid, have been isolated from the bark.

Botany of the plant:

Carallia brachiata Merrill (Rhizophoraceae) is a large tree occurs throughout India up to an altitude of 1300 m and often planted as ornamental tree. Commonly known as Karalla. *Carallia brachiata* is evergreen tree having bark is dark grey, corky and furrowed.The leaves are decussate, simple, elliptical to obovate in shape. The margin is entire to dentate or serrate and often with black dots beneath. The stipules are interpetiolar and lance-shape Flowers are

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bisexual, cream coloured, sessile, small, in short, trichotomous axillary branching cymes, calyx tube campanulate, valvate; petals reddish, inserted on a crenulate disc; stamens 10-16, inserted with them on the disc, one of each pair opposite the petal, slightly longer than the other filament, which is opposite to a sepal; filaments filiform; anthers small; ovary half inferior, 3-5-celled; ovules 2 in each cell; style subulate; stigma 4-lobed. Fruit is glossy pink to red round, 5 mm in diameter. Seeds are kidney-shaped (Nair and Henry, 1983).

2. METHODOLOGY

An extensive literature survey of the *Carallia brachiata* was done and data was collected. *C. brachiata* bioactivities, traditional uses, phytochemical constituents and antibacterial was conducted in scientific databases, including PubMed, Elsevier, ResearchGate, Scopus, and Google Scholar. All selected articles were thoroughly evaluated and focused on traditional uses, potential therapeutics; chemical components and bioactivity of *C. brachiata* were used.

Use of Leaves:

A decoction of leaves mixed together with benzion, turmeric and rice dust is used in treatment of sapraemia (Ling *et al;* 2004). Other phytoconstituents such as megastigmanediglycoside (3-hydroxy5,6-epoxy-β-ionol-3-O-βapiofuranosyl (1→6)-β-glucopyranoside), alkaloids (hygroline), tannins, flavonoids and glyceroglycolipids have been reported from the leaves of the plant (Nadkarni *et al.*, 1995; Fitzgerald, 1995).

In the northeastern part of India, *C. brachiata* leaves have long been used to treat diabetes mellitus, according to ethnomedical surveys. The hydro-alcoholic extract (HAE) of *C. brachiata* leaves is screened for antidiabetic and antioxidant properties in this study. Ethanol:water (7:3) was used in the cold maceration process to create the HAE. Streptozotocin-induced diabetic rats were used to test the antidiabetic effects of HAE in vivo for 21 days at doses of 250 or 500 mg/kg body weight.

Antioxidant activity in vitro and in vivo was also assessed for the extract. The HAE of *C. brachiata* leaves shown good hypoglycemic action in diabetic rats, according to the results. When compared to normal rats, the hypoglycemic action of HAE was observed to be considerable. The antioxidant activity results were statistically significant when compared to quercetin and gallic acid, two common medications. The results suggested that the HAE of *C. brachiata* leaves may have a role as herbal antioxidants in the prevention and/or treatment of diabetes brought on by oxidative stress.The findings indicated that the antidiabetic effects of HAE may be due to antioxidant plant phenolics and flavonoids. With the isolation of bioactive flavonoids with antidiabetic potential, more investigation into the biochemical processes of antidiabetic activity can be conducted on the HAE of *C. brachiata* leaves (Junejo *et .al*, 2020).

Uses of Bark:

The traditional uses of the bark in the treatment of itching, cuts and wounds, oral ulcers, inflammation of the throat and stomatitis are well documented (Nadkarni *et al.*, 1995). Some scientific studies have also been performed on this plant. The ethyl acetate and methanol extracts of bark have been reported to possess anti-inflammatory (Krishnaveni *et al.*, 2009a), wound healing (Krishnaveni *et al.*, 2009b), and antimicrobial activities (Neeharika *et al.*, 2010). It has been reported that proanthocyanidins named carallidin, mahuanin and para-hydroxy benzoic acid are some compounds isolated from the bark of *C. brachiata*. Proanthocyanidins has been reported to possess free radical scavenging activity (Phuwapraisirisan *et al.*, 2006). The bark is used in medications given orally to clear eye infections; and in the prevention of pox and other infections. It is also used in thwayhsay (blood fortifying preparations) and fever-reducing remedies. Made into a paste, the bark is applied topically to relieve itching (Perry, 1980). Pharmacological effects of *C. brachiata* had been reported to show antioxidant effects against the development of diabetes. Their findings suggest that ethanol extract of *C. brachiata* stem has a better anti-adipogenesis effect than the leaf part by suppressing adipogenesis-related gene expression. Moreover, inhibition of lipid storage could be decreased insulin resistance risk (Chularojmontri *et al*., 2022).

Proximate composition of leaves and fruits:

The proximate composition and mineral constituents of *C. brachiata* leaf and fruit powder were evaluated for their nutritional values and mineral compositions by using standard techniques. Ash, carbohydrates, proteins, fiber, fat, moisture, and total energy content (dry basis) were measured in proximate analysis, and an atomic absorption spectrophotometer was used for mineral analysis.The species showed variable results in proximate analysis of both the parts; however, the fruit of *C. brachiata* had a larger percentage of carbohydrates (65.74%) and energy values (310.25 Kcal/100g). The leaf has a greater proportion of crude fibers (18.87%) and proteins (13.59%).The findings demonstrated that both the parts of *C. brachiata* were abundant in micronutrients such as copper, zinc, and iron. The health advantages of using the species in marginal communities can be ascertained with the aid of proximate and

nutritional analysis.Fruit is an excellent supply of potassium, moisture, and carbohydrates, whereas leaves are a good source of zinc, fiber, fat, and ash, according to the results of the proximate and mineral evaluation. According to the findings, plant fruits may significantly help humans satisfy their nutritional needs for healthy growth if they are ingested in appropriate quantities. It was suggested that *C. brachiata* fruits be used for nutritional purposes going forward due to the variety and quantity of nutrients they contain (Patil and Chavan, 2015).

Phytochemical and physicochemical analysis:

The preliminary phytochemical and physicochemical studies including fluorescence and thin layer chromatographic analyses of the leaves of *C. brachiata* used traditionally in the treatment of a variety of human disorders, were carried out with an objective to standardize the plant/plant part (leaves) to be used either as crude drug or in the form of herbal medicine, considering the quality and safety requirements of herbal drugs as per pharmacopoeial standards and/or WHO guidelines. Standardization is an essential analytical aspect for the study of identity, purity and quality of crude drug sample of plant origin. Chemical and physiochemical analyses reveal useful information which is of utmost importance for the quality control of *C. brachiata* leaves to be used as crude drugs. The documentation of standardized parameters therefore are an indispensable element in the development of herbal drugs from raw plant drugs (crude preparations), considering their desired therapeutic and safety profile (Julfikar Ali, 2014).

Other uses:

Medium-weight, robust, and weather-resistant, the wood is vulnerable to termite and sea borer attacks. Its durability is moderate to poor when exposed to the ground or weather.Suitable for general construction, house building, pallets, packing material, musical instruments, tool handles, picture frames, veneer, interior finish and panelling, posts, cabinetry, furniture, parquet flooring, railroad sleepers, and more, the exquisitely marbled wood is easy to saw and plane and takes a fine polish. Because of its high energy value, the wood produces high-quality charcoal and fuel wood.

3. FUTURE PROSPECTS AND RESEARCH NEEDS

Although ethnomedicinal claims exist; systematic pharmacological and clinical studies are scarce. Areas requiring further exploration include isolation and characterization of novel bioactive compounds, detailed toxicological studies to ensure safety and potential applications in nutraceutical and pharmaceutical industries.

4. CONCLUSION

Carallia brachiata is a promising medicinal tree with significant traditional relevance and preliminary scientific support for antioxidant and antimicrobial activities. Due to its widespread use and easy accessibility in coastal communities, the plant has enormous ethnomedicinal significance. However, comprehensive research is required to validate its pharmacological potential and develop standardized therapeutic applications.

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Conflicts of Interest:

The authors declare no conflict of interest.

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