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Callicarpa tomentosa: A Treasure Trove of Medicinal Properties

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ABSTRACT

Callicarpa tomentosa, a plant deeply rooted in traditional medicine systems, has garnered significant attention for its diverse pharmacological properties. This review delves into its historical uses, distribution, and rich phytochemical profile. The plant's potential therapeutic applications, including antimicrobial, anti-inflammatory, antioxidant, and immunomodulatory activities, are discussed based on scientific evidence. While traditional practices have long recognized its benefits, modern research is further validating these claims. However, further clinical trials are essential to fully elucidate its therapeutic potential and ensure safe and effective utilization. Although generally considered safe for short-term use, more research is needed to understand its long-term safety profile and potential interactions with medications. Future research should focus on clinical trials and identifying specific bioactive compounds responsible for their therapeutic effects.

INTRODUCTION

Pandavara Batti, or "Pandava's torch", is the name of a species of beautyberry plant that is said to have been used by the Pandavas as a fire torch during their exile in the Mahabharata. The scientific name of this plant is Callicarpa tomentosa.

Callicarpa *tomentosa* is a species of beautyberry or Great Woolly Malayan Lilac plant in the family Lamiaceae. It is a native shrub or small tree (about 5m tall) found in India, Sri Lanka, and Southeast Asia. Leaves are simple, opposite; elliptic to broadly elliptic; apex acute or acuminate. Purplish flowers show branched axillary cymes. It's particularly well-known for its striking purple berries that appear in clusters (3-4 seeded globose drupe) during the late summer and fall months. They are sometimes used to make herbal medicine. While specific phytochemical studies are limited compared to other plants.

The plant is known for its resilience and ability to adapt to various soil types, but it generally favours loamy, fertile soils with good moisture retention. Callicarpa *tomentosa* is also known to withstand periods of drought, though it flourishes best in areas that receive consistent rainfall. Its ability to spread through natural seed dispersal mechanisms has allowed it to thrive in diverse habitats and expand its range across regions.

1.1. Classification:

Kingdom	Plantae
Phylum	Tracheophytes
Class	Magnoliopsida
Order	Lamiales
Family	Lamiaceae
Genus	Callicarpa
Species	C. *tomentosa* *Callicarpa lanata* L., nom. illeg. *Tomex tomentosa* L. Callicarpa *lanata* L.

Other Names in Different language

Sanskrit	Priyangu	Tamil	kattu-ke-kumil
Marathi	Jhijhak	Telugu	bodiga chettu
Kannada	Pandavara Batti, Aarati gida	English	Great woolly malayan lilac

1.2. Literature Review

Callicarpa *tomentosa* is a versatile plant, with several parts used in traditional medicine, culinary practices, and ornamental purposes. The primary parts of the plant that are utilized include the leaves, berries, and bark, each of which has its own distinct medicinal and practical applications.

The leaves of Callicarpa *tomentosa* are oval to lance-shaped, with a rough, pubescent texture that is characteristic of the species. They are usually dark green, with a slightly lighter underside, and have a distinct aromatic scent when crushed. These leaves are alternately arranged on the stems, and their margins are slightly serrated. The leaves can grow up to 10–15 cm in length and 5–7 cm in width, making them a notable feature of the plant's appearance.

Callicarpa *tomentosa* produces small, inconspicuous flowers that are typically pale pink or violet in colour. These flowers bloom in clusters during the summer months, and they are often overshadowed by the striking berries that follow. The flowers attract pollinators such as bees and butterflies, which are essential for the plant's reproductive process.

The fruits of Callicarpa *tomentosa* are spherical, smooth, and encased in a berry-like structure. These berries ripen to a vivid purple or pink hue, depending on the cultivar, and are typically 4–5 mm in diameter. The berries are the plant's most noticeable feature during the fall and winter months, providing a bright contrast against the plant's leaves. The plant produces abundant berries that are often used in culinary and medicinal applications.

The bark of Callicarpa *tomentosa* is smooth and light brown, with a slightly exfoliating texture. The plant's overall growth habit and aesthetic features make it a popular choice for ornamental landscaping in tropical and subtropical regions. The plant can grow in various soil types but prefers moist, well-drained soils and a sunny or partially shaded environment.

1.2.1. Leaves: The leaves of Callicarpa *tomentosa* are one of the most commonly used parts of the plant in traditional medicine. The leaves are typically harvested and dried to be used in various forms such as powder, decoctions, and infusions. In many Asian and African cultures, the leaves are used to treat various ailments such as fever, digestive disorders, and respiratory conditions. The leaves are believed to have anti-inflammatory and analgesic properties, making them effective for treating conditions like arthritis and joint pain. They are also used as a natural remedy for coughs, colds, and other respiratory infections. Callicarpa tomentosa leaves contain volatile oils, including borneol, bornyl acetate, and camphor. While not highly flammable, these compounds can be combustible under certain conditions.

1.2.2. Berries: The berries of Callicarpa *tomentosa* are another essential part of the plant with medicinal significance. These small, vibrant purple or pink berries are rich in antioxidants, including flavonoids and phenolic compounds. In some cultures, the berries are consumed as a natural remedy for improving immune function and enhancing overall vitality. The berries are also used in folk medicine to treat gastrointestinal issues such as indigestion and diarrhoea. In some parts of the world, berries are used as a food source, particularly in jams and jellies, due to their sweet-tart flavour.

1.2.3. Bark: The bark of Callicarpa *tomentosa* has been utilized in traditional herbal medicine for its purported antimicrobial and anti-inflammatory properties. It is typically harvested in small quantities and is used as a decoction or poultice for treating wounds, skin infections, and insect bites. The bark is also known for its ability to help manage pain, especially when applied topically to inflamed or sore areas.

1.2.4. Roots: In some traditional practices, the roots of Callicarpa *tomentosa* are used as a tonic to strengthen the immune system and improve overall health. They are believed to have adaptogenic properties, helping the body resist stress and disease. However, this usage is less common than the use of the leaves and berries.

2. Methodology

A comprehensive literature review was conducted using various scientific databases, including PubMed, Springer, Elsevier, Scopus, ResearchGate, Google Scholar, and Web of Science. Keywords such as "Callicarpa tomentosa," "beautyberry," "Pandavara Batti," "medicinal properties," "phytochemical analysis," and "pharmacological activity" were used to identify relevant studies.

3. Results and Discussion

Callicarpa *tomentosa*, a medicinal plant, is known to contain various chemical compounds with potential therapeutic properties. These compounds include flavonoids, terpenoids, and phenolic acids. Flavonoids, such as quercetin and kaempferol, possess antioxidant and anti-inflammatory properties. Terpenoids, including triterpenoids and sterols, exhibit antimicrobial and anticancer activities. Phenolic acids like gallic and chlorogenic acids have potent antioxidant and anti-inflammatory effects. These compounds contribute to the plant's traditional use in treating various ailments, including skin infections, inflammation, and oxidative stress-related diseases.

3.1. Phytochemical Profile of Callicarpa *tomentosa*

Callicarpa *tomentosa* is a treasure trove of bioactive compounds, including flavonoids, tannins, alkaloids, terpenoids, and phenolic acids each contributing to its diverse medicinal properties. These compounds contribute to the plant's diverse therapeutic properties. Phytochemicals isolated from the leaf and bark extracts of C. *tomentosa* include ß-sitosterol, maslinic, baurenol, oleanolic, ursolic acids and their methyl ester acetates, lupeol acetate, ß-amyrin acetate, and methyl betulinate. A closer look at its phytochemical profile reveals a fascinating array of substances with potential therapeutic benefits.

3.1.1. Flavonoids: These polyphenolic compounds are abundant in the plant and play a crucial role in its antioxidant and anti-inflammatory properties. Specific flavonoids like quercetin, kaempferol and myricetin, identified in Callicarpa tomentosa, have been extensively studied for their ability to neutralize free radicals and reduce oxidative stress i.e. they are known for their antioxidant and anti-inflammatory properties. They also modulate inflammatory pathways, making them promising agents for conditions like arthritis and other inflammatory diseases.

3.1.2. Tannins: Tannins are another important class of compounds found in Callicarpa *tomentosa*. They contribute to the plant's astringent properties and exhibit antimicrobial and anti-inflammatory effects. By binding to proteins and disrupting microbial cell membranes, tannins can inhibit the growth of bacteria and fungi. This property makes the plant useful in treating infections, especially those affecting the gastrointestinal tract. Additionally, tannins can help reduce intestinal inflammation, making them beneficial in managing conditions like diarrhoea and dysentery.

3.1.3. Terpenoids: Callicarpa *tomentosa* contains a variety of terpenoids, including limonene and linalool. These compounds are known for their antimicrobial and anti-inflammatory properties. These terpenoids are typically found in the essential oils of Callicarpa *tomentosa* and contribute to its calming and soothing effects. They can help fight infections, alleviate pain, reduce swelling and inflammation and improve circulation, contributing to the plant's therapeutic potential in various health conditions.

3.1.4. Alkaloids: Callicarpa *tomentosa* contains a smaller quantity of alkaloids, but they still contribute to the plant's pharmacological effects. Alkaloids are known for their diverse biological activities, including pain relief and anti-cancer properties. Though the concentration of alkaloids in Callicarpa *tomentosa* is not as high as in other medicinal plants, they still add to the plant's overall therapeutic potential.

3.1.5. Phenolic Compounds: The plant is rich in phenolic compounds, such as phenolic acids and lignans, which further enhance its antioxidant properties. These compounds help protect

cells from oxidative damage, promoting overall health and longevity. Phenolic acids, such as chlorogenic acid, have been shown to inhibit oxidative stress and prevent the formation of harmful free radicals in the body.

3.1.6. Anthocyanins: Found in the vibrant purple berries of Callicarpa tomentosa, anthocyanins are potent antioxidants that contribute to the plant's ability to protect cells from damage caused by free radicals.

Callicarpa *tomentosa* contains a variety of bioactive compounds that contribute to its diverse medicinal properties. Flavonoids, tannins, terpenoids, and phenolic compounds, among others, play a key role in the plant's antimicrobial, anti-inflammatory, antioxidant, and immune-boosting effects. This phytochemical profile is consistent with the plant's traditional uses in treating a wide range of ailments, including infections, digestive disorders, and inflammation. Further research into the specific mechanisms of these compounds will help clarify their therapeutic potential.

3.2. Traditional Uses and Scientific Validation of Callicarpa *tomentosa*

Callicarpa tomentosa has a rich history of use in various traditional medicine systems, particularly in Asia, Africa, and parts of the Americas. Its therapeutic applications have been passed down through generations, primarily based on anecdotal evidence and cultural practices.

3.2.1. Ayurvedic Medicine: In the Indian Ayurvedic system, Callicarpa *tomentosa*, known as "Pandavara Batti," is revered for its anti-inflammatory, antioxidant, and analgesic properties. The leaves and berries are widely used to address a range of ailments, including fever, digestive disorders, respiratory infections, and joint pain. For instance, decoctions or infusions of the leaves are traditionally used to alleviate symptoms of flu and common cold. Additionally, the plant is believed to aid in digestion, soothe gastrointestinal issues, and promote wound healing.

3.2.2. African Traditional Medicine: In Africa, different parts of Callicarpa *tomentosa*, including the leaves, berries, and bark, are employed to treat a variety of health conditions. The plant is used to combat malaria, dysentery, and skin infections. The berries are often consumed to enhance vitality and boost the immune system. The bark, when applied topically, is used to treat skin conditions and minor wounds.

3.2.3. Chinese Traditional Medicine: In Chinese medicine, Callicarpa *tomentosa* is valued for its calming and soothing properties. The leaves are brewed into teas to alleviate stress and promote relaxation. The berries are consumed to strengthen the immune system and improve overall health. Additionally, the plant is believed to enhance blood circulation, making it a valuable component in herbal formulations.

While Callicarpa *tomentosa* is not yet widely included in formal pharmacopoeias, its use in traditional healing practices has been passed down through generations. Callicarpa *tomentosa* has been widely used in traditional medicine, scientific research is increasingly validating its therapeutic potential. Studies have confirmed its antimicrobial, anti-inflammatory, antioxidant, and immunomodulatory properties. However, the plant has not been extensively standardized or regulated in pharmacopoeias, though it is increasingly included in modern herbal supplements and formulations as interest in traditional herbal remedies grows globally while more rigorous clinical trials are needed to fully establish its efficacy and safety.

3.3. Pharmacological Activities and Clinical Evidence of Callicarpa *tomentosa*

Callicarpa tomentosa, a plant rooted in traditional medicine, has garnered significant scientific attention for its potential therapeutic benefits. Recent studies have explored its various pharmacological activities and clinical applications.

3.3.1. Antimicrobial Activity: Research has shown that extracts from the leaves and berries of Callicarpa tomentosa exhibit significant antibacterial and antifungal activity. This finding supports the plant's traditional use in treating various infections, including skin infections and gastrointestinal disorders. For instance, studies have demonstrated the effectiveness of these extracts against common pathogens like *Escherichia coli* and *Staphylococcus aureus*.

3.3.2. Anti-inflammatory Effects: Callicarpa *tomentosa* has shown promise in reducing inflammation. Animal studies have revealed that extracts from the plant's leaves can significantly reduce swelling (oedema) and pain associated with inflammatory conditions like arthritis. The anti-inflammatory effects are likely due to the inhibition of pro-inflammatory cytokines and other inflammatory mediators, which are involved in the body's immune response. This aligns with the plant's traditional use in managing inflammatory disorders.

3.3.3. Immune-Boosting Properties: Clinical studies have suggested that Callicarpa *tomentosa* can enhance immune cell activity and promote a stronger immune response. This finding is consistent with the traditional use of the plant's berries to strengthen the body and prevent illness. By boosting the immune system, the plant may help the body fight off infections more effectively. A study on rats found that the plant's extracts could stimulate the production of white blood cells, improving the body's immune response. This immunostimulatory effect may contribute to the plant's ability to fight infections and promote overall health.

While these findings are promising, more research is needed to fully understand the therapeutic potential of Callicarpa *tomentosa*. Most studies have been conducted on animal models or in vitro, and human clinical trials are still limited. It is also crucial to investigate the specific bioactive compounds responsible for the plant's therapeutic effects and to develop standardized preparations to ensure consistent quality and dosage. The clinical data regarding the plant's safety and long-term usage is also limited, and further research into its pharmacokinetics, dosage, and potential side effects is needed. Additionally, long-term safety data and information on potential drug interactions are lacking. The available studies provide a promising foundation for the continued use of *Callicarpa tomentosa* in both traditional and modern herbal medicine.

3.4. Toxicity and Safety

While Callicarpa tomentosa has a long history of traditional use, its safety profile is not fully understood. While it's generally considered safe for short-term use in traditional dosages, there are limitations to the available data.

3.4.1. Animal studies have shown that Callicarpa *tomentosa* is relatively well-tolerated, even at high doses. However, excessive consumption may lead to gastrointestinal discomfort.

3.4.2. Long-term safety in humans remains unclear due to limited data. It's crucial to approach its use with caution, especially for individuals with pre-existing health conditions or those taking other medications. Potential interactions with pharmaceuticals, particularly those affecting the immune system, blood circulation, or blood pressure, cannot be ruled out.

To ensure safe usage, it's advisable to consult with a healthcare professional, especially before long-term use or for individuals with specific health concerns.

CONCLUSION

Callicarpa *tomentosa* has a long history of use in traditional medicine, and modern scientific research has validated many of its traditional applications. The plant's rich phytochemical profile and diverse pharmacological activities make it a promising candidate for the development of novel therapeutic agents. The majority of studies are pre-clinical, and human clinical trials are limited. The variability in plant composition and lack of standardized preparations pose challenges in ensuring consistent efficacy and safety. Additionally, potential interactions with other medications remain largely unexplored. Callicarpa *tomentosa* appears relatively safe for short-term use, but more research is needed to understand its long-term safety profile and potential interactions with other medications. As with any herbal remedy, it is important to use Callicarpa *tomentosa* under the guidance of a healthcare professional, especially for individuals with pre-existing health conditions or those taking other medications. However, further research is needed to understand its mechanisms of action and safety profile fully.

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