



EXPLORING THE THERAPEUTIC POTENTIAL OF *CLERODENDRUM INFORTUNATUM*: A COMPREHENSIVE REVIEW

Dr. Sapna Shrikumar¹, Archana S²

1. Department of Pharmacognosy, M Pharm, Ph.D. , MBA, Dean- Academic Placement and Research, HOD, Nehru College of Pharmacy, Kerala University of Health Sciences, Thrissur, 680588, India
2. Department of Pharmacognosy, Mpharm Student of Nehru College of Pharmacy, Kerala University of Health Sciences, Thrissur, 680588, India

Abstract

Clerodendrum infortunatum, commonly known as Peruvellam in Malayalam and Bhand in Hindi, is a medicinal plant belonging to the Verbenaceae family. Indigenous to India, especially the sub-Himalayan region, this shrub is extensively utilized in traditional medical systems like Ayurveda and Unani. Across its roots, leaves, bark, stems, flowers, and seeds, it harbors a rich array of active compounds such as clerodin, alkaloids, steroids, and glycosides. Renowned for its anti-inflammatory, antimicrobial, anticancer, and expectorant properties, it contains unique crystalline compounds like clerodolone and clerosterol, contributing to its medicinal value. Traditional applications include wound healing, helminthiasis treatment, pain relief, and mosquito repellence. Scientific research corroborates its diverse pharmacological activities, including antifungal, antibacterial, anthelmintic, antioxidant, wound healing, anticancer, antidiabetic, and anti-inflammatory effects. In summary, *Clerodendrum infortunatum* stands as a versatile medicinal plant deeply rooted in traditional wisdom and validated by modern scientific exploration, offering a wide range of therapeutic benefits.

Keywords : *Clerodendrum infortunatum*, Clerodin, Clerodone, Clerodolone, Pharmacological activities

1. Introduction

Clerodendrum infortunatum is a medicinal plant belongs to the family Verbenaceae. In Malayalam it is commonly known as Peruvelam and in Hindi it is known as Bhan[1]. It is an important and widely used medicinal plant, reported to contain active bitter substances like clerodin, has been widely used as tonic and anthelmintic agents[2]. *Clerodendrum infortunatum* is largely found in India, especially in the sub-Himalayan region of West Bengal, Burma and Malaysia. The roots, leaves, bark, stems shows various medicinal properties[1]. The plant is used as medicine for various purposes either singly or in certain polyherbal formulations in various indigenous systems of medicine including Ayurveda, Unani and Homeopathy[3]. The plant mainly contains active compounds such as alkaloids, steroids, tannins, glycosides, volatile oils, fixed oils, resins, phenols, flavonoids etc[1]. Exploring the historical use of *Clerodendrum infortunatum* offers a unique opportunity to bridge the gap between traditional wisdom and modern scientific understanding. Traditional practitioners have revered this plant for its purported anti-inflammatory, antimicrobial, anti cancer and expectorant properties[3]

2. Methodology

a. Botanical Description

Clerodendrum infortunatum is a terrestrial shrub having square, blackish stem, and hairy leaves with disagreeable odor. Macroscopically the leaf was dark green in color, simple, opposite decussate, ovate shaped, margin dentate and hairy on both sides, with reticulate pinnate venation. The average leaf size was 10–20 cm (length) and 9–15 cm (width). Flowers are Bluish-purple often white, tinged with pink or red, borne in terminal trichotomous panicles, corolla-tube exceeding the glandular calyx lobe. Fruits are Globose drupes, enlarged pinkish or reddish calyx, containing 1–4 pyrenes, black when ripe and seeds oblong[4].



Leaves and flowers of *Clerodendrum infortunatum* plant

b. Scientific classification

The scientific classification of the plant was given in Table 1.

Kingdom	Plantae
Order	Lamiales
Family	Lamiaceae/Verbinaceae
Species	<i>C. infortunatum</i>
Botanical name	<i>Clerodendrum infortunatum</i>
Synonyms	<i>Clerodendrum infortunatum</i> , <i>Clerodendrum viscosum</i> , <i>Clerodendrum calycinum</i>
Vernacular name	Khanduchakka, Bharangi, Bhagri

Table 1. Scientific classification of *Clerodendrum infortunatum*

c. Chemical composition

The phytochemical makeup of *C. infortunatum* has been widely discussed and determined by several groups from early times due to its undeniable ethnomedicinal values. The foremost components accounted are triterpenes, flavonoids, saponins, steroids, alkaloids, glycoside etc[6]. Novel crystalline compounds such as clerodolone, clerodone, clerodol, and sterol clerosterol are from the root. Seven sugars like raffinose, lactose, maltose, sucrose, galactose, glucose, and fructose were identified. Fumaric acid, caffeic acid esters, β -sitosterol and β -sitosterol glucoside were isolated from the flowers. Apigenin, acacetin, and a new flavone glycoside, characterized as the methyl ester of acacetin-7-O-glucuronide are isolated from the flowers. Saponin is one of the major compounds of the leaf. 24 β -ethylsterols, clerosterol and 22-dehydroclerosterol, 24-methyl-sterols (24-methylcholestanol, 24-methylcholesterol, 24-methyl-22-dehydrocholesterol, and 24-methylthosterol) and 24 β -ethyl-22-dehydrocholestanol are found in the seeds. Scutellarin and hispidulin-7-O-glucuronide are present in the leaf. Poriferasterol and stigmasterol are the components of the aerial parts[7].

The more information on the presence of various phytochemicals in different parts of plants are shown in Table 2.

PART	PHYTOCHEMICALS
Root	Alkaloids, Flavonoids, Terpenoids, Glycosides, Tannins, Saponins, Steroids, Phenols

Leaf	Terpenoids, Flavonoids, Alkaloids, Gallic acid, Tannins, Phenolics, Glycosides, Phytosterols
Whole plant	Flavonoids, tannins, Sterols, Terpenoids, Anthraquinone glycosides
Flower	Apigenin, Acacetin
Seeds	Quercetin

Table 2. Phytochemicals in different parts of *Clerodendrum infortunatum* plants

d. Traditional uses

Tribal communities in Attappady, Kerala, India uses paste that are made from leaves to treat wounds. Indigenous communities in Bangladesh utilises the plant in conditions such as helminthiasis, pain, sprain, fracture, joint displacement, diabetes and fever. In Manipur the plant is used against boils. Dry leaves together with cowdung is used as a mosquito repellent in Orissa. In rural communities of South Kerala, India, the fresh leaves of the plant are used as one of the ingredients in the formulations of medicated water for bathing women after delivery[3] . Many tribes of North Bengal such as Rabha, Rajbanshi, Polia, and Lepcha have a custom of setting up fresh root bark for treating diarrhea. Leaf extracts is used to alleviate stomach pain and diabetes by the Kachari, Hmar, and Riang tribes of Barak Valley and North- Cachar hills. The root paste is used as a bandage in swelling and fresh leaf juice has been used as vermifuge and in the treatment of malaria [6

e. Pharmacological properties

Clerodendrum infortunatum, a plant deeply rooted in traditional medicine, unveils a myriad of pharmacological activities, showcasing its potential therapeutic benefits and contributing to the growing interest in exploring natural remedies for various health conditions. The various pharmacological properties of this plant are:

- Antifungal activity: Many studies revealed the antifungal activity of *C. infortunatum* against a wide range of human and plant pathogenic and the storage fungi[3,8]

PART	ACTIVITY AGAINST
Leaf, root, stem	<i>Aspergillus niger</i> , <i>A. flavus</i> , <i>A.fumigatus</i> , <i>Fusarium oxysporum</i> , <i>F. vasinfectum</i> , <i>Mucor sp.</i> and <i>Candida albicans</i>

Leaf	<i>A. niger</i> , <i>P. notatum</i> , <i>P. frequentance</i> , <i>Botrytis cinera</i>
Root, stem, leaf	<i>A. niger</i> , <i>A. flavus</i> , <i>A. fumigatus</i> , <i>Mucor</i> <i>sp.</i> , <i>F. oxysporum</i> and <i>C. albicans</i>

Table 3. Antifungal activity of *Clerodendrum infortunatum*

- Antibacterial activity: The extract of *C. infortunatum* exhibit antibacterial activity against *Staphylococcus aureus*, *Bacillus subtilis* and *Enterobacter faecalis*. The antibacterial activity of various solvent extracts of *C. infortunatum* leaves against a panel of test bacteria by disc diffusion and MIC determination method [3,2]

PART	ACTIVITY AGAINST
Leaf	Gram positive and gram negative bacteria, <i>E. coli</i> , <i>Sarcina lutea</i> and <i>Shigella sonnei</i>
Root	Gram positive and gram negative bacteria
Aerial parts	<i>K. pneumoniae</i> , <i>E. coli</i>
Root, Stem, Leaf	Gram positive and gram negative bacteria

Table 4. Antibacterial activity of *Clerodendrum infortunatum*

- Anthelmintic activity: Alcohol and aqueous extracts from the leaves of *Cleodendrum infortunatum* were investigated for anthelmintic activity against *Pheretima posthuma* and five concentrations (5, 10, 15, 20 and 25 mg/ml) of each extracts were studied in activity, which involved the determination of time of paralysis and time of death of the worm. Both the extracts exhibited significant anthelmintic activity at high concentration of 100 mg/ml. [2,9,10].
- Antioxidant activity: The antioxidant activity was performed with different methods like RSA assay (DPPH Radical Scavenging Activity), FRAP assay (Ferric reducing antioxidant power), Ferric Thiocyanate (FTC) Method, and Thiobarbituric Acid (TBA) Method. The antioxidant activity is calculated. The study shows that the ethanolic extract of the leaves possesses antioxidant activity through the DPPH free radical scavenging activity, reducing power assay, and scavenging of hydrogen peroxide [7,11]
- Wound healing activity: A study revealed the wound healing potential of roots by excision, incision and dead space wound models in rats. Topical application of the ointment cream bases of root extracts show significant wound healing activity in terms of increased area of epithelialization, by an increase in wound contraction, skin breaking strength and tissue granulation dry weight [12].

- Anticancer activity: The ethanolic extract of the dried leaf was studied for anti- cancer activity on cultured cell line. The study describes that change in concentration of drug extract changes the activity, and hence it is dose dependent. The high concentration used for the test was 100 µg/ml, and is shown to be reduces the cell growth to about 50% [13] .
- Antidiabetic activity: The methanolic extract of leaves of *C. infortunatum* is effective against STZ-induced diabetes in Wistar rats, due to its augmenting endogenous antioxidant mechanisms. It can be further inferred that *C. infortunatum* leaves may serve as an interesting candidate for the effective management of diabetes mellitus [14] .
- Anti-inflammatory activity: The anti-inflammatory activity of some extracts of the root bark of *Clerodendrum infortunatum* were screened by proteinase inhibitory assay and nitric oxide scavenging assay. The total phenolic content was evaluated by Folin Ciocalteu method. The active extract was tested against carrageenan induced paw edema. Aqueous acetone extract was found to possess maximum anti-inflammatory activity in the in vitro screening study and the phenolic content correlates with the anti-inflammatory activities. In the carrageenan induced acute inflammatory study, the administration of aqueous acetone extract significantly reduced the paw volume in carrageenan treated rats. The haematological, biochemical and histopathological findings also points to the anti-inflammatory activity of the extract. Thus the phenolic compounds present in the root bark of the plant may be responsible for the activities exhibited by the plant and hence it can be used against inflammatory diseases [15]

3. Conclusion

Clerodendrum infortunatum, commonly known as Peruvelam in Malayalam and Bhand in Hindi, emerges as a highly significant medicinal plant deeply rooted in traditional medicine systems such as Ayurveda, Unani, and Homeopathy. Throughout history, this plant has been revered for its diverse therapeutic properties, ranging from anti- inflammatory and antimicrobial to anticancer and expectorant effects. The rich phytochemical composition of *Clerodendrum infortunatum*, including compounds such as clerodin, alkaloids, steroids, flavonoids, and glycosides, contributes to its pharmacological versatility. Moreover, scientific investigations have validated many traditional uses of *Clerodendrum infortunatum*, confirming its efficacy in various health conditions. Studies have demonstrated its antifungal, antibacterial, anthelmintic, antioxidant, wound healing, anticancer, antidiabetic, and anti- inflammatory activities. These findings underscore the plant's potential as a valuable source of natural remedies for a wide range of ailments.

Overall, *Clerodendrum infortunatum* stands as a multifaceted medicinal plant with immense therapeutic potential, offering a promising avenue for further research and exploration in both traditional and modern medicine systems.

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