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Review Article

A Review of Phytochemical and Pharmacological Profile of *Clerodendrum Viscosum Vent*

Anshu Gangwar*[1], Aeshika Sharma[2], Vimal Kumar Singh[3], Prashant Kumar[4]

[1,2] *Department of Pharmacy, M.J.P. Rohilkhand University, Bareilly, Uttar Pradesh (243006)*
[3,4] *Department of Pharmacy, Faculty of Engineering and Technology, MJP Rohilkhand University, Bareilly, (243006)*

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ABSTRACT

Aim: This review aims to compile and critically evaluate recent research findings on the phytochemical composition and pharmacological potential of Clerodendrum viscosum, with special focus on its antioxidant, analgesic, diuretic, and anticancer properties. Background: Clerodendrum viscosum Vent., commonly known as hill glory bower or bhant in local languages, has been traditionally valued in tropical and subtropical medicine systems such as Ayurveda and Unani. The plant is rich in diverse phytochemicals and has been associated with various pharmacological effects. Body: A comprehensive literature search was conducted using databases such as Scopus, PubMed, ScienceDirect, and Google Scholar. Studies have shown that different plant parts contain a wide range of bioactive compounds, including phenolics, phenylpropanoids, flavonoids, tannins, quercetin, saponins, alkaloids, terpenoids, and steroids. These compounds contribute to significant medicinal properties such as antioxidant defence, pain relief, diuretic function, and potential anticancer activity. Traditional use in Ayurveda and Unani highlights its therapeutic prominence, while experimental evidence further validates many of these claims. Conclusion: The pharmacological activities observed in Clerodendrum viscosum suggest it is a promising natural source of compounds with therapeutic potential. Further detailed investigations, including clinical trials and bioactivity-guided isolation, are essential to establish its efficacy and safety, thereby promoting its application in modern medicine.

INTRODUCTION

Natural products are viewed as a significant asset in the field of medicinal formulation. Scientists have invested many years in the pursuit of new natural materials from diverse sources, including microscopic organisms, flora, and other living entities [1,2]. The goal of these initiatives is to

***Corresponding Author:** Anshu Gangwar
Address: *Department of Pharmacy, M.J.P. Rohilkhand University, Bareilly, Uttar Pradesh (243006)*
Email : Subhgangwar15@gmail.com
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evaluate their effectiveness as antioxidants, pain relievers, and diuretics, as well as to gain insight into their mechanisms within the body. *Clerodendrum viscosum,* commonly referred to as hill glory bower or Bhant, is a shrub that typically reaches heights of 1 to 2 meters and is indigenous to the region. This species is commonly located in various warm regions, including Bangladesh, India, Myanmar, Thailand, Malaysia, and Sri Lanka[3,4]. This plant belongs to the Verbenaceae family and thrives in agricultural settings as well as in low-lying areas adjacent to roadways, railways, industrial zones, and newly developed communities[4-6]. The initial description of the group was made by Linnaeus in 1753, naming Clerodendrum infortunatum as its main species, which is the same as Clerodendrum viscosum found in India. In 1763, Adanson revised the plant's name, switching it from Clerodendrum in Latin to *Clerodendron* in Greek. However, in 1942, two centuries later, Moldenke reverted the name to *Clerodendrum*[7]. The plant's name is derived from two Greek terms: "Kleros," meaning "chance" or "fate," and "dendron," which translates to "tree". *Clerodendrum viscosum* houses a diverse array of natural chemicals, featuring phenolics, flavonoids, tannins, quercetin, saponins, alkaloids, terpenoids, and steroids[8-10]. These substances can be located throughout the plant, particularly in the leaves and roots. Important chemical constituents of the leaf encompass phenols, tannins, flavonoids, alkaloids, saponins, proteins, simple sugars, along with several acids such as oleic, stearic, lignoceric, gallic acids, in addition to sterols and triterpenoids[11-17]. The key active parts found in *Clerodendrum viscosum* include limonene, catechol, p-vinylguaiacol(4-ethenyl-2-methoxyphenol), 5,8,11-eicosatriynoic acid, stigmasterol, desulphosinigrin, guaiacol(2-methoxyphenol), tyrosol-d4(4-hydroxy-benzeneethanol-4d), vaccenic acid, hexadecanoic acid, phytol, betulin, and hydroxymethylfurfural[18] .In addition, compounds such as (3β,5Z,7E)-9,10-Secocholesta-5,7,10(19)-trien-3,24,25-triol, eugenol (2,6-dimethoxy-4-prop-2-enylphenol, cinnamic acid (3-[2-(1,2,3,4-tetrahydronaphthalen-2-ylmethyl)phenyl] propanoic acid, and vanillic acid (methyl 2-(4-acetyloxy-3-methoxyphenyl) acetate) were isolated from *Clerodendrum viscosum* [18] .

Extracts from plants and natural compounds have been a significant component of traditional healing practices, including Ayurveda, Homeopathy, and Unani. The juice extracted from the plant is beneficial in treating worm infections, coughs, itching, and various other ailments. It aids in eliminating worms, induces vomiting, and provides mild relief for constipation. Renowned for its advantageous qualities, this plant helps to reduce inflammation, protect nerves, relieve discomfort, combat cancer, fight pathogens, lower blood sugar, safeguard the liver, and act as an antioxidant [19-26]. The plant is often experienced with a widely noxious odor [27]. Its flowering and fruiting time is from February to May. Due to its wide distribution, various parts of the plant are extensively used in traditional medicines for treatment of common ailments. Several phytochemicals are distributed throughout the plant, but the contents present in leaves and roots are preferred largely for such treatments. This review summarizes the specific pharmacological properties of these extracts and highlights on their traditional uses, scientific validation and phytochemical composition.[28]

PLANT PROFILE

A small tree or bush with soft, hairy branches that are sharply four-sided at the top. The leaf is whole, shaped like an egg with a short point at the tip, and has a heart shape at the base. It measures about 16 by 12 cm and is thick and paper-like. The veins

are a bit like fingers spreading out, with five main lines. The flower cluster is at the top, loose, and can be up to 20 cm long. The small leaf-like structures at the base of the flowers are not very noticeable. A pedicle that is 2 cm long. [27,28]

- **Species** : *Clerodendrum viscosum* vent.
- **Family** : Verbenaceae
- **Common name** : Hill Glory Bower
- **Collection Locality** : Dohra road, near MJP Rohilkhand University, Bareilly
- **Habitat** : Degraded deciduous forest
- **Habit** : Shrub
- **Flower, Fruit** : October-July
- **Native** : India

Fig. *Clerodendrum viscosum vent*

PHYTOCHEMICAL CONSTITUENTS

Clerodendrum viscosum Vent., also known as *Clerodendrum infortunatum*, is a perennial shrub widely recognized for its medicinal properties in traditional medicine. Phytochemical analyses have identified a diverse array of bioactive compounds within this plant, contributing to its therapeutic potential.[29-34]

1. Terpenoids: The plant contains various terpenoids, including monoterpenoids, diterpenoids, and triterpenoids. Notably, compounds such as clerodolone, clerodol, and clerosterol have been isolated from the roots.[35,36]

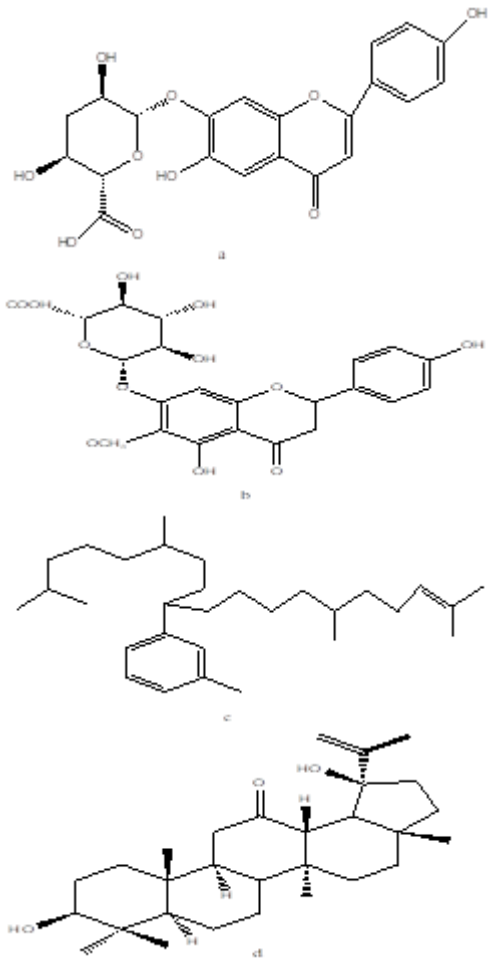
2. Flavonoids: Flavonoids like scutellarin and hispidulin-7-O-glucuronide have been identified in the leaves, while apigenin and acacetin are present in the flowers.

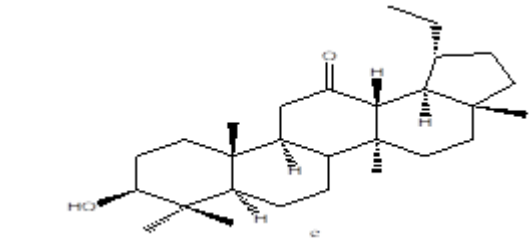
3. Steroids: Steroidal compounds, including β-sitosterol and stigmasterol, have been detected in various parts of the plant.

4. Phenolic Compounds: Phenylethanoid glycosides such as angoroside C and martynoside have been reported, contributing to the plant's antioxidant properties.[37]

5. Saponins: Saponins are among the major compounds found in the leaves, contributing to the plant's medicinal properties.

Chemical Structures of different compounds





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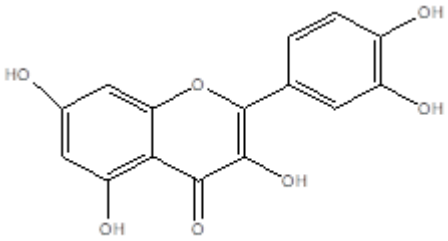

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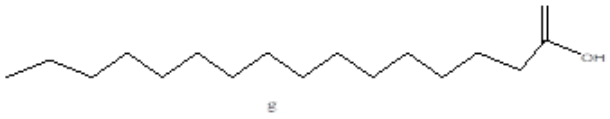

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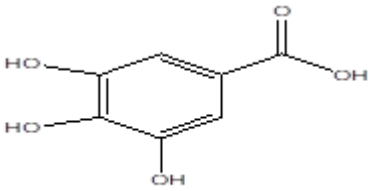

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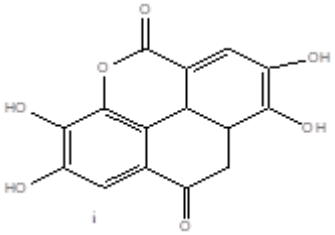

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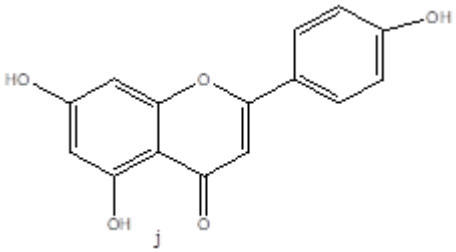

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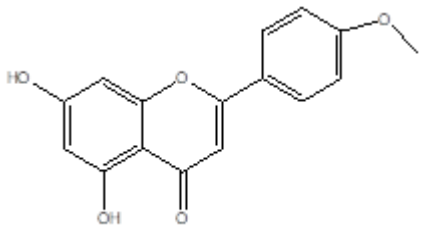

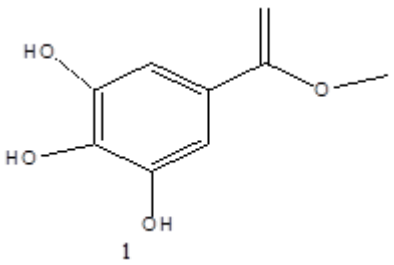

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Table 1: - Name of the given structures

Sr. No	Name	Sr. No	Name
A.	Scutellarin	G.	Palmitic acid
B.	Hispidulin-7-0 glucuronide	H.	Gallic acid
C.	Viscosene	I.	Ellagic acid
D.	Clerodolone	J.	Apigenin
E.	Pregnanolone	K.	Acacetin
F.	Quercetin	L.	Syringic acid

TRADITIONAL USES

The healing capabilities of plants have made them essential to human health over time. Many individuals continue to rely on plants to maintain their health. Ayurveda, a traditional Indian health system, has a rich history of sharing knowledge about plant-based treatments. In Ayurvedic medicine, it's claimed that the extracts of *Clerodendrum viscosum* can assist with respiratory ailments, skin irritations, gastrointestinal problems due to worms, and leprosy. The sap extracted from its bark was beneficial for alleviating stomach discomfort and pain, while the juice from its leaves proved effective against scorpion stings. In the Unani tradition, it was employed to relieve joint discomfort and to expel worms[38]. In Indian Homeopathy, it is recognized for helping with diarrhoea, issues after giving birth, and treating fresh cuts or wounds. Leaves rubbed with cooking oil can help relieve pain quickly. In the Chotanagpur plateau region of India, residents utilize various plant components such as roots, stems, and leaves to prepare remedies for ailments like asthma, cataracts, malaria, and problems related to blood, skin, and lungs. Fresh leaves are utilized to create traditional remedies for coughs as

well as treatments for expelling worms.[39]. Similar uses were found in Thailand, where people use leaves and roots as medicine to treat intestinal infections and kidney problems[40]. In Bangladesh, the juice from leaves is employed for worm removal, inducing vomiting, aiding in mild cases of constipation, and enhancing bile synthesis. It is also used on the skin for growths, skin issues, snake bites, and scorpion stings.[41]

Table 2 :- Pharmacological activity shown by different parts.[42-49]

Sr. No.	Plant part	Uses
1.	Whole plant	Colic pain, scorpion sting, snake bite, skin diseases, treatment of tumor, Bronchitis, asthma, fever, diseases of the blood, inflammation, burning sensation, epilepsy etc.
2.	Leaves	As vermifuge, treatment of malaria, Inflammation, skin diseases, smallpox Bitter tonic, anti-periodic, pain killer, laxative, Wounds, leprosy Traditional expectorant pills, Tumors, scorpion stings
3.	Roots	Laxative, diuretic, analgesic, anti-inflammatory, anti-tumor antibacterial activities

PHARMACOLOGICAL ACTIVITIES

The diverse phytochemical profile of *Clerodendrum viscosum* underpins its wide range of pharmacological activities, including:

1. **Antioxidant:** The presence of phenolic compounds and flavonoids contributes to significant antioxidant activity.[50-54]
2. **Anticancer:** Studies have indicated potential anticancer properties, particularly against cervical cancer cell lines.
3. **Antimicrobial:** The plant exhibits antimicrobial activity against various pathogens, attributed to its rich phytochemical content.

Different types of flavonoids. Apigenin, acacetin, quercetin, scutellarin, hispidulin-7-0-glucuronide, and cabruvin are different chemical compounds found in the plant. There are also terpenoids like clerodin, and some phenolic compounds such as fumeric acid, stearic acid, and caffeic acid. Additionally, the plant contains anthraquinones and alkaloids, which can be found in specific parts or throughout the entire plant. Viscosum means thick or sticky. These substances have been found to help treat various animal diseases. Other substances have been taken from this plant, including steroids like clerodolone, clerodone, clerodol, and clerosterol from the root extracts. In addition to steroids, there are a few other substances like scutellarin, hispidulin-7-0-glucuronide, and apigenin, acacetin[51] , viscosene[52] In 2009, there was research about saponin[54].

1. INSECTICIDAL ACTIVITY:

Extracts obtained from the leaves and stems of *Clerodendrum viscosum* demonstrated significant efficacy in managing pests such as tea mosquito bugs, tea red spider mites, and flour beetles. They outperformed both the neem tree and synthetic pesticides. Extracts from leaves dissolved in various liquids proved effective in combating insects found in stored grains. In Manipur, the presence of this plant deters rice insects. Ethanol extracts showed strong effects against worms, working better than regular medicines.[55-58]

2. ANTIMICROBIAL ACTIVITY:

Research indicates that extracts from the roots, stems, and leaves of *Clerodendrum viscosum* possess antibacterial and antifungal properties. Various solvents such as acetone, chloroform,

alcohol, ethanol, and ethyl acetate proved to be effective. Leaf extracts dissolved in ethanol and ethyl acetate showed excellent efficacy, producing a significant combined action against different bacteria and fungi, and at times, exceeding the effectiveness of regular pharmaceuticals.[59-62]

3. ANALGESIC ACTIVITY:

Pain-relief medicines can often have serious side effects, but plant products like *Clerodendrum viscosum* provides safer options. Leaf-derived saponin increased the effectiveness of conventional pain relievers. Pain relief observed in mice and rats was achieved through alcohol extracts from the leaves and roots, showing effects similar to the analgesics pethidine and indomethacin. [63-65]

4. ANTINOCICEPTION:

Extracts made with methanol and ethanol from *Clerodendrum viscosum* showed strong pain-relieving effects in Swiss albino mice. Higher doses of the ethanolic extract were more effective in reducing acetic acid-induced pain, yet it was not as potent as aminopyrine. Yet, in a separate research study, the findings indicated effects that resemble those of diclofenac sodium. [66,67]

5. ANTICONVULSANT:

Saponin an isolated major compound from *Clerodendrum viscosum* had shown dose-dependent anticonvulsant activity in leptazol-induced seizures on Swiss albino mice.[68]

6. WOUND HEALING:

Wound healing potency of chloroform and ethanolic leaf extract was tested in rats and was found significant as that of nitrofurazone drug.[69]

7. ANTI-INFLAMMATORY:

Sample taken from the hanging root structures of *Clerodendrum viscosum.* performed tests involving rats and mice, effectively reduced carrageenan-induced swelling, exhibiting more pronounced results at elevated dosage. The outcomes were substantial and closely resembled the effects of standard anti-inflammatory agents like phenylbutazone and indomethacin.[70,71]

8. ANTI-SNAKE VENOM:

Alcohol-based extract from *Clerodendrum viscosum* provided protection to mice in a way that increased with the dose against the venom of the Naja naja snake. The venom from snakes targets specific receptors in the body that play a crucial role in muscle movement. By binding to these receptors, the root extract can inhibit the venom's attachment and mitigate its adverse effects. [72-74]

9. ANTIOXIDANT:

Ethanol leaf extract of *Clerodendrum viscosum* showed powerful antioxidant effects in tests like DPPH, FRAP, and hydrogen peroxide, doing better than extracts from petroleum ether and chloroform. Laboratory experiments and research conducted on living organisms demonstrated a significant capacity to counteract harmful radicals and enhance antioxidant activity. Among various solvent types, the ethyl acetate extract demonstrated the highest effectiveness in eliminating harmful substances during the ABTS, NO, and H_2O_2 assays.[6,19,44,53]

10. HEPATOPROTECTION:

Methanol leaf extract of *Clerodendrum viscosum* helped protect the livers of rats from damage caused by carbon tetrachloride. It greatly improved blood test results and helped the liver work better. Tissue studies indicated that the

treatment preserved a normal appearance of the liver relative to subjects that were not treated.[75]

11. CYTOTOXIC ACTIVITY:

Cytotoxic activity of *Clerodendrum viscosum* was proved using brine shrimp lethality assay, where mortality increased with rising concentrations of root and leaf methanolic extracts. Compared to vincristine sulphate (LC50: 0.773 mg/mL), the plant extract showed an LC50 value of 3.696 mg/mL, indicating notable cytotoxic potential.[76,77]

CONCLUSION

Clerodendrum viscosum has a long history of use in traditional medicinal systems throughout several Asian countries, particularly in India, where it is commonly employed to treat a wide range of diseases in both humans and animals. The plant holds significant ethnomedicinal value; however, despite its extensive traditional applications, only a limited number of bioactive constituents have been isolated and scientifically evaluated. Consequently, the therapeutic potential of many of its phytochemicals remains insufficiently explored. Among the reported compounds, flavonoids such as apigenin, acacetin, and various flavone glycosides are known to play a major role in providing antifungal activity. In addition to flavonoids, several diterpenoid and related compounds, including clerodin, lupine, clerodone, uncinatone, and pectolinarigenin, contribute significantly to the plant's insecticidal and antiparasitic properties. Furthermore, a distinct class of saponins isolated from *C. viscosum* has been shown to exhibit notable analgesic and anticonvulsant effects, supporting its traditional use in the management of pain and neurological disorders. The presence of these diverse phytoconstituents indicates that *C. viscosum* is a promising source of pharmacologically active compounds. Therefore, further systematic phytochemical isolation and detailed pharmacological studies are required to fully validate and utilize its medicinal potential.

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