



PHYTO-PHARMACOLOGICAL AND CHEMICAL PROFILE OF *CLERODENDRUM SERRATUM LINN.*

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Abstract: *Clerodendrum serratum* Linn. (Family: Verbenaceae) is very widely distributed in tropical and subtropical regions of the world. Ethno-medicinal importance of the plant has been reported in various indigenous systems of medicines like Ayurveda, Siddha and Unani for the treatment of various life-threatening diseases such as syphilis, typhoid, cancer, jaundice and hypertension. The study of the plant *Clerodendrum serratum* focussed on the botany, phytochemistry, ethnomedicinal and pharmacological activities of the plant. The chemical constituents such as carbohydrates, flavonoids, phenolics, steroids, and terpenes is present. The plant is to be useful as anti-inflammatory, anti-cancer, hepato-protective, anti-diarrheal and anti-microbial properties.

Keywords: *Clerodendrum serratum* Linn.

Introduction:

According to World Health Organization (WHO), medicinal plants would be the best source to obtain a variety of drugs. About 80% of individuals from developed countries use traditional medicine, which has compound derived from medicinal plants. Therefore, such plants should be investigated to better understand their properties, safety and efficiency. Plants produce a diverse range of bioactive molecules, making them a rich source of different types of medicinal compound; have continued to play a dominant role in the maintenance of human health, since ancient times. Over 50% of all modern clinical drugs are of natural product origin and it also plays an important role in drug development programs in the pharmaceutical industry. Plants are the basic source of knowledge of modern medicine. The basic molecular and active structures for synthetic fields are provided by rich natural sources. This made worldwide interest in medicinal plants reflects recognition of the validity of many traditional claims regarding the value of natural product in health care. Most of the drugs derived from plants were developed because of their use in traditional medicine. India's use of plants for health care dates back close to 5000 years. About 8000 herbal remedies have been codified in the Ayurveda, which is still in use in many dispensaries today¹.

Clerodendrum serratum Linn. is a genus of flowering plants in the Verbenaceae family. Estimates of number of species in *Clerodendrum* vary widely, about 450. The genus is native to tropical and warm temperate regions of the world, with most of the species occurring in tropical Africa and southern Asia, but some in the tropical Americas and northern Australia, and a few extending north into the temperate zone in eastern Asia².

Vernacular names³

Bengali: Bamunhatee, Bamanhatee, Bhuijam
English: Blue glory, Beetle killer
Gujarati: Bharangee
Hindi: Bharangi
Kannada: Gantubarangee
Malayalam: Cheruthekku
Marathi: Bharangee, Bharang
Oriya: Chinds
Punjabi: Bhadangee
Sanskrit: Angaravalli, Padma, Brahmanayashtika, Barbura
Tamil: Cheruteku
Telugu: Ganttubrarangee
Urdu: Bharangi, Baharangi

Taxonomy⁴

Domain: Eukaryota
Kingdom: Plantae
Sub-kingdom: Viridaplantae
Phylum: Tracheyophyta
Sub-phylum: Euphyllophytina
Infraphylum: Radiatopses
Division: Angiospermae
Class: Magnoliopsida
Subclass: Lamiidae
Order: Lamiales
Family: Lamiaceae/ Verbenaceae
Sub-family: Ajugoideae
Genus: *Clerodendrum*
Species: *serratum*

Geographical distribution

Clerodendrum serratum Linn. is distributed throughout in the forest of India and Sri Lanka. It is cultivated up to altitude 1400 ft. above sea level (Sharma *et al.*, 2009). It is also found in lower Himalaya from Kumaun eastwards, west Bengal and Bihar. It is documented to be found in Madagascar, South Africa, South Asia and Asian countries also.



Fig. *Clerodendrum serratum* Linn. The plant

Macroscopy

Clerodendrum serratum Linn. is a slightly woody shrub with blunt stems and branches. This tree are about 2-8 ft high. It is annual or perennial, usually aromatic.

Root: Mature root hard, woody, and cylindrical; upto 5 cm thick; external surface light brown having elongated lenticels.

Stem: Usually quadrangular (four-angled).

Bark: Thin and easily separated from a broad wood which shows marked medullary rays and concentric growth rings in a transversely cut surface; short fractures; acrid taste.

Leaf: Leaves usually three at a node, sometimes opposite oblong or elliptic, serrate, alternate without stipules.

Flower: Blue, many in long cylindrical thyrus. They are bisexual, zygomorphic, rarely sub-actinomorphic, and bracteolate or not. Corolla with a slender tube, lobe-5, spreading; stamens epipetalous, 4 or 2, free; anther 1 or 2-celled usually dehiscent longitudinally; disc persistent. Ovary superior, 2-celled and each cell 2-ovuled; and style sub-terminal and gynobasic.

Fruit: Four lobed purple drupe.

Seed: With or without endosperm⁵.

Pollination

Clerodendrum serratum has an unusual pollination syndrome which avoids self-pollination. This mating system combines dichogamy and herkogamy. The flowers are protandrous. When the flower opens, the stamens stand erect, parallel to the central axis of the flower, while the style bends over, holding the stigma beyond the rim of the corolla. After the pollen is shed, the stamens curl up or bend over, and the style straightens out, bringing the stigma to the center of the flower (Wikipedia).

Phyto-chemistry

The minerals reported in the plant were: Na, Mg, Al, K, Ca, V, Cr, Mn, Fe, Co, Ni. The leaves yielded α -spinasterol, (+) – catechin, luteolin and luteolin-7-O- β -D- glucuronide and flavones namely apigenin, luteolin, baicalein, scutellarein, 6-hydroxyluteolin; a glucoside of 6- hydroxyluteolin; caffeic and ferulic acids; and a mixture of glucose, arabinose and glucuronic acid. The bark was rich in saponins, which on hydrolysis yielded saponin mixture containing three major triterpenoid constituents viz., oleanolic acid, queretaroic acid and a new acid serratagenic acid identified as 3 β - hydroxyl-oleane-28, 29-dioic acid. The sugars identified were D-glucose, Lrhamnose and D- xylose. The bark also contained β -sitosterol and D-mannitol. Preliminary studies of root reported the presence of flavonoids, glycosides, saponins, sterols and absence of alkaloids and terpenoids. In another screening, the root showed presence of alkaloids and saponins and absence of tannins. The root bark contained D-mannitol. Other components identified in root bark were an unidentified saponin and glucose.

Ethnomedicinal / Traditional Uses

- Roots and leaf extracts of *C. serratum* has been used for the treatment of rheumatism, asthma and other inflammatory diseases⁶.
- The roots of the plant have been claimed to be used in dyspepsia, seeds in dropsy and leaves as a febrifuge and in cephalgia and ophthalmia.
- Aqueous extracts of leaves of *C. serratum* possess bronchodilator property⁷.
- Previous studies suggests that apigenin-7-glucoside has demonstrated anti-inflammatory, antimicrobial, hepato-protective and anti-diarrheal properties. The compound also showed significant protection against Alzheimer's disease in mice.

PHARMACOLOGICAL ACTIVITIES

Alpha glycosidase inhibitory activity

Methanolic extract of *Clerodendrum serratuam* roots (100 μ g/ml) was evaluated for alpha glycosidase inhibitory activity using enzyme assay. The enzyme was not found significantly effective (32.3% inhibition with IC₅₀ value 265 \pm 9 μ g/ml) and may require higher dose to produce the effect⁸.

Wound healing activity

Wound healing activity is carried out on the ethanolic extracts of root and leaves of *Clerodendrum serratum* were and it was evaluated on Albino Rats. The results showed higher woundhealing potency of the root extract as compared to the leafextract. As compared with the control both the extractsdemonstrated significant wound healing activity⁹.

Anti-inflammatory activity

Anti-inflammatory activity is carried out on the carrageenan induced odema in rats. The ethanolic root extract of *Clerodendrum serratum* showed significant anti-inflammatory activity, and also in the cotton pellet model in experimental mice, rats and rabbits at concentrations of 50, 100 and 200mg/kg¹⁰.

Antioxidant activity

In DPPH radical scavenging assay, ethanolic extract of root at various concentrations (50, 100, 150, 200, 250 µg/ml) and ascorbic acid (50, 100, 150, 200, 250 µg/ml) showed the significant inhibitory activity with IC₅₀ value 175 and 137 respectively. In reducing power assay, concentration 20-120 µg/ml shows a linear increase in reducing power, equivalent to 20-120 µg/ml ascorbic acid. Presence of hydrophilic polyphenolic compounds is responsible to give the greater reducing power. The IC₅₀ values were 48 and 85 for ascorbic acid, ethanolic extract of CSR respectively. The inhibition of $73.32 \pm 0.002\%$, and $64.49 \pm 0.242\%$ was observed for standard and ethanolic root extract (test) respectively at maximum concentrations¹¹.

Anti-asthmatic activity

Alcoholic root extract of *Clerodendrum serratum* of 100 and 200 mg/kg showed anti-asthmatic activity in oval albumin induced experimental mice. In this model the anti-asthmatic activity is probably acting through inhibition of inflammatory mediators like histamine, serotonin and prostaglandins due to cyclooxygenase inhibitors¹².

Anticancer activity

Aqueous and methanolic extract of roots of *Clerodendrum serratum* were screened using Dalton's Lymphoma Ascites (DLA) cell model at the dose 100 mg and 200 mg/kg body weight for in vivo anticancer activity. The parameters were analysed mean survival time, body weight analysis, percentage increase in life span, haematological parameters and biochemical parameters. As compared to aqueous extract methanolic extract exhibit significant anticancer activity¹³.

Conclusion

This review paper describes the study of the plant *Clerodendrum serratum*. The study focused on the botany, phytochemistry, ethnomedicinal and pharmacological activities of the plant. The chemical constituents such as carbohydrates, flavonoids, phenolics, steroids, and terpenes were found. The plant was found to be useful as anti-inflammatory, anti-cancer, hepato-protective, anti-diarrheal and for its anti-microbial properties. The above data would be helpful in further study of the plant parts and research and development in field of medicine and therapeutic significance.

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