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RESEARCH ARTICLE

PHYTO-CHEMICAL AND PHARMACOLOGICAL REVIEW OF *CLERODENDRUM SERRATUM* (BHARANGI)

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ABSTRACT

In this review, an attempt has been made to delineate with pharmacological and phytochemical aspects of *Clerodendrum serratum* Linn. *Clerodendrum serratum* commonly known as Bharangi is traditionally valued and reported for having Bronchodilator, Wound healing, Anti-inflammatory, Anti-oxidant, Anti allergic, anticancer activity. Phytochemical study shows the presence of Saponins, terpenoids, D-mannitol, minerals, glycosides which are responsible for the pharmacological activity. This review paper highlights the various phytochemical and pharmacological activities of *Clerodendrum serratum*.

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INTRODUCTION

Plant and plant derived products are being used as medicine throughout human history. Herbal medicine is the oldest form of healthcare known to mankind, herbs has been used by all cultures throughout history (Agrwal *et al*., 2013). In ancient literature of India (Veda, Purana and Upanishad) and China the description of use of plant derived medication was written (Ahmad *et al*., 2006). Today in increasing population more than 80% of world's population, depend on traditional plant based medicines for treatment of minor ailments. Because plant products are easily available, relatively safe and affordable. Plant are source for synthesis of different chemical compounds which perform important biological functions but, all the chemical constituents found in plant are not biologically active molecules. The primary metabolites are produced by plants for their normal functioning and growth. But, secondary metabolites compounds which produced by plants for their defence mechanism and pathogen attack (Shrivastava *el al*., 2007).

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Clerodendrum serratum

The genus *Clerodendrum* is a diverse genus with about 560-580 species (Moldenke, 1971) of small tree, shrub or occasionally perennial herbs mostly in the tropics and subtropics of the old word (Verdcourt, 1992). Around 18 formulations containing *Clerodendrum serratum* root used for treatment of various ailments indicated in traditional literature and Ayurvedic pharmacopoeia of India.

Synonyms

1. Bharangi - Hindi, Gujrati, Marathi, Urdu.
2. GantuBharangi - Kannada, Telgu.
3. Sirutekku - Tamil.
4. Cherutekku - Malayalam.
5. Vamunahati - Bengali.
6. Chinda - Oriya.
7. Blue glory - English.

Different synonym of bharangi indicates morphological and pharmacological activities like:

1. Bharangi - Destroy diseases.
2. Kharasaka – With rough leaves.

3. Padma - Flower look like lotus.
4. Vatari - An enemy of vatadosa.
5. Kasaghni - Which alleviates cough.

Biological source

Clerodendrum serratum is perennial woody, flowering shrub of Verbenaceae family.

Geographical source

Clerodendrum serratum 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.

Macroscopic characters (Rueda, 1993; Lahoti, 2015)

1. Leaves: Leaves are usually three at a node. The leaves are opposite oblong or elliptic, and acute at base.
2. Root: Root are 5 cm thick, cylindrical, hard, woody and light brown in colour.
3. Stream: Usually quadrangular.
4. Flower: Flowers are arranged in dichotomous cymes, purple in colour.
5. Fruit: Four lobed.
6. Seed: With or without endosperm.

Taxonomical hierarchy of *Clerodendrum serratum* (Verbanaceae)

1. Kingdom – Plantae
2. Division - Magnoliphyta
3. Class - Magnoliopsida
4. Order - Lamiales
5. Family - Verbenaceae
6. Genus - Clerodendrum
7. Species - Serratum

Phytochemistry (Lahoti, 2015; Hegde, 2015; Singh, 2012)

Many systematic efforts have been made by various researchers to isolate and identify biologically active constituents from various plant parts. The minerals present in plants were Na, Mg, Al, K, Ca, Cr, Mn, Fe, Co and Ni. The major constituents present in *Clerodendrum serratum* genus are carbohydrates, phenolics, flavonoids, terpenoids and steroids.

Carbohydrates

Generally, D-mannitol has been found in the roots of the Plant.

Flavonoids

Flavonoid are further sub-grouped intocatechins, leucoanthocyanidins, flavanones, flavanonols, flavones, anthocyanidins, flavanols, chalcones, aurones and isoflavones. The isolated flavonoids likehispidulin and cleroflavone possesspotent anti-oxidant, anti-microbial, anti-asthmatic, anti-tumour and CNS binding activities.

Terpens

Terpenoids are generally found to be bound to sugarmoieties by a glycoside linkage. The terpens isolated from plants are betulin, oleanolic acid, clerodermic acid, betulinic acid, friedel in and monomelittoside. These terpens having weak CNS activity, strong molluscicidal and fungi toxic activities.

Phenolics

The phenolic compound found in found in both free as well as bound to sugar moieties. Phenolic compounds isolated from *Clerodendrumserratuam* were serratagenic acid, acteoside, indolizino and verbascoside which possess biologically activities such as anti-oxidant, anti-microbial, anti-proliferative, anti-hypertensive and anti-cancer activities.

Steroids

Steroids are terpenes based on the cyclopentaneper hydroxyphenanthrene ring. Chiefly, γ-sitosterol, β-sitosterol, cholestanol, clerosterol, campesterol and 24-ethyl cholesterol were reported to be isolated from the plant. Preliminary phytochemical screening of different extract of *Clerodendrum serratuam* were given in Table 1 (Agrwal *et al*., 2013).

Table 1. Phytoconstituents in methanolic leaves extracts of *Cledrodendrum serratum*

Phytochemical constituents	Petrolium ether	Chloroform	Alcohol (95%)	Aqueous
Alkaloids	-	-	+	-
Flavonoids	+	-	+	+
Carbohydrates	+	+	-	+
Saponins	+	-	+	-
Terpenoids	+	-	+	+
Steroids	+	+	+	+
Tanins	-	-	+	-
Glycosides	-	-	-	-

Pharmacological activity

Alpha glycosidase inhibitory activity

Methanolic extract of *Clerodendrumserratuam* roots (100µg/ml) was evaluated for alpha glycosidase inhibitory activity using enzyme assay. The enzyme was not found significantly effective (32.3% inhibition with IC_{50} value 265±9 µg/ml) and may require higher dose to produce the effect (Bachhawat *et al*., 2011).

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 wound healing potency of the root extract as compared to the leaf extract. As compared with the control both the extracts demonstrated significant wound healing activity (Vidya *et al*., 2005).

Antioxidant activity

In DPPH radical scavenging assay, ethenolic 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 IC_{50} 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 gives the greater reducing power. The IC50 values were 48 and 85 for ascorbic acid, ethanolic extract of CSR respectively. The inhibition of 73.32 ± 0.002%, and 64.49 ± 0.242% was observed for standard and ethanolic root extrat (test) respectively at maximum concentrations (Bhujbal *et al*., 2009).

Antiasthamatic activity

Alcoholic root extract of *Clerodendrumserratuam* of 100 and 200 mg/kg showed antiasthamatic activity in oval bumin induced experimental mice. In this model the antiasthamatic activity is probabaly acting through inhibition of inflammatory mediators like histamine, serotonin and prostaglandins due to cyclooxygenase inhibitors (Thalla *et al*., 2012).

Anticancer activity

Aqueous and methanolic extract of roots of *Clerodendrum serratum* were screened using Dalton's Lymphoma Ascites (DLA) cell modelat 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 activity (Zalke *et al*., 2010).

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 antiinflammatory activity, and also in the cotton pellet model in experimental mice, rats and rabbits at concentrations of 50, 100 and 200 mg/kg (Narayan *et al*., 1999).

Spermatotoxic activity

Methanolic extract of *Clerodendrum serratum* at dose 100, 300 and 500 mg/kg shows significant spermatotoxic activity in male albino rats. The *Clerodendrum serratum* treatment result in impairment of male fertility in the rat by both spermatogenesis and caudaepididymal spermatozoa (Sarathchandiran *et al*., 2014).

Antiulcer activity

The methanolic extract of *Clerodendrum serratum* root (200mg/kg) possess significant antiulcer activity in a dose dependent manner by improving gastric mucosal defence mechanism. It shows significant decrease in number of ulcer, ulcer score and ulcer index in ethanol induced ulcer (Sharma and Gupta, 2013).

Conclusion

This review paper describes the botany, phytochemistry & various pharmacological activities of the plant *Clerodendrum serratum*. The chemical constituents such as Carbohydrate, Flavonoids, Sterols, Phenyl propanoids, Terpenoids & Iridoids were found. The plant was found to be useful as Wound healing, Anti-inflamatory, Anti-oxidant, Antiasthmetic, Spermatotoxic & Anticancer activities which was further scope for research & development.

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