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# Formulation and evaluation of herbal gel (*Clerodendrum Serratum* Linn) blue glory

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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. The roots of C. serratum are also used as anti-oxidant, anti-bacterial, and anti-fungal. Besides these the antimicrobial value of this herbal plant have also been reported in its stems and leaves. These reports are very encouraging and indicate that herb should be studied more expensively for its therapeutic benefits. Various minerals like Na, Mg, Al, Ca etc. saponins, terpenoids, D-mannitol are the phytoconstituents present in the plant.

The present research reflected towards exploring the plausible role(s) of the active extracts of Clerodendrum Serratum (leaves), Aloe vera gel , Honey formulated as Herbal Gel product. The formulation were characterized by determining the pharmaceutical characteristics like skin irritancy test, pH, appearance, viscosity, spreadability, extrudability, swelling index, and washability. Further, wound healing activity was studied . The phytochemical constituents such as alkaloids, flavonoids, glycosides, tannins, carbohydrates, sterols, saponins, proteins, and other miscellaneous phenolic components are believed to play a pivotal role in the healing of the wound by significantly increasing the rate of wound closure and rate of epithelization. This finding provided an insight into the applications of the herbal formulations in the traditional treatment of serious wound conditions and also rejuvenating the ethnopharmacological principles in context to modern medicine.

Thus, this paper highlights the various pharmacological activities of *Clerodendrum serratum* and formulation of herbal gel and its further scope for clinical utility.

**Keywords:** *Clerodendrum serratum*; Anti-oxidant; anti-bacterial; Anti-hypertensive; Anti-cancer; Anti-syphilis; Wound healing

## 1. Introduction

*Clerodendrum serratum* (Linn.) Moon belongs to the family of Verbenaceae. It is commonly known as Bharangi [1] in Hindi, Marathi. The parts used are the root and leaf. [5] Its roots are bitter, acrid, thermogenic, antiinflammatory, digestive, carminative, stomachic, anthelmintic, depurative, expectorant, sudorific, antispasmodic, stimulant and febrifuge and are useful in inflammations, helminthiasis, cough, asthma, bronchitis, tumors, tubercular glands, dropsy, consumption, chronic inflammation of the nose, skin diseases, leucoderma, leprosy and fever. Leaves are useful as an external application for cephalalgia, and ophthalmia.

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

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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. 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.

### 1.1. Vernacular names ( ayurvedic pharmacopoeia )

- 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

### 1.2. Taxonomical identification ( 6 )

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

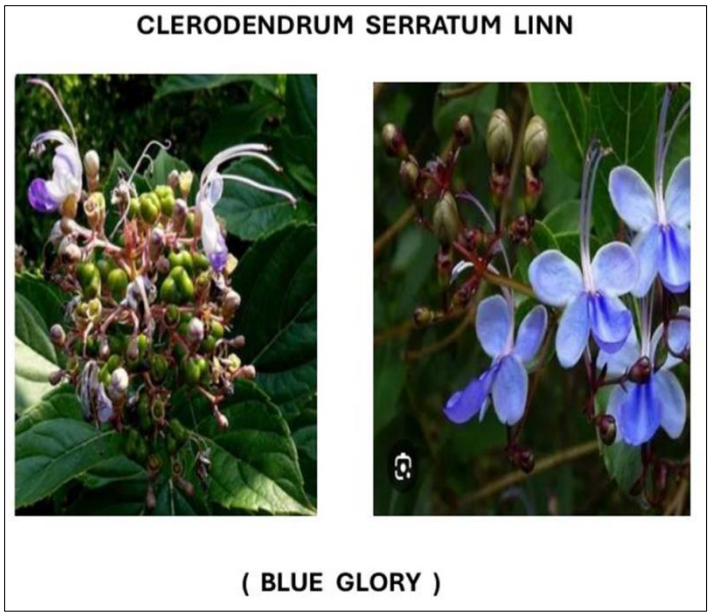


**Figure 1** Blue Glory Flowers

### 1.3. Plant profile

- Family : Lamiaceae
- Ayurvedic Name : Bharangi
- Latin Name : Clerodendrum Serratum Linn
- English Name : Blue Glory , Blue - Flowered Glory Tree
- Parts Used : Whole Plant

**Figure 2** *Clerodendrum serratum* the plant

### 1.4. Phytochemistry ( 8 )

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 sapogenin mixture containing three major

triterpenoid constituents viz., oleanolic acid, queretaroic acid and a new acid serratagenic acid identified as 3β-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.

### 1.5. Macroscopy

*Clerodendrum serratum* is a slightly woody shrub with blunty stems and branches. This tree are about 2-8 ft high. It is annual or perennial, usually aromatic (Findmeacure, Ayurvedic Pharmacopoeia, Zipcodezoo).

- **Root**: Mature root hard, woody, 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 thyrsus. They are bisexual, zygomorphic, rarely sub-actinomorphic, bracteolate or not. Corolla with a slender tube,lobe-5, spreading; stamens epipetalous, 4 or 2, free; anther 1 or 2-celled usually dehiscing longitudinally; disc persistent. Ovary superior, 2-celled and each cell 2-ovuled; and style sub-terminal and gynobasic.
- **Fruit**: Four lobed purple durpe.
- **Seed**: With or without endosperm.

### 1.6. Pollination

*Clerodendrum serratum* has an unusual pollination syndrome which avoids self-pollination. 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).

### 1.7. Phytochemistry

The major groups of chemical constituents present in the Clerodendrum genus are carbohydrates, phenolics, flavonoids, terpenoids and steroids.

#### *1.7.1. Carbohydrates*

Generally, D-mannitol have been found in the roots of the plant(Shrivastava et al., 2007).

#### *1.7.2. Flavonoids*

Flavonoids are further sub-grouped into catechins, leucoanthocyanidins, flavanones, flavanonols, flavones, anthocyanidins, flavanols, chalcones, aurones and isoflavones. These isolated flavonoids like hispidulin and cleroflavone possesspotent anti-oxidant, anti-microbial, anti-asthmatic, anti-tumor and CNS-binding activities. Other flavonoids isolated from plants are apigenin, 7-hydroxy flavanone, scutellareinand pectolinarigenin (Shrivastava et al.,2007:Harbone,1984: et al ., 1984)

#### *1.7.3. Phenolics*

The phenolic compounds in the genus Clerodendrum are found in both free as well as bound to sugar moieties. Some of the phenolic compounds isolated were serratagenic acid, acteoside, indolizino and verbascoside which possess biologically activities such as anti-oxidant, anti-microbial, anti-proliferative, antihypertensive and anti-cancer activities(Shrivastava N. et al., 2007; Harbone J.B., 1984; Mann J. et al., 1984).

#### *1.7.4. Terpenes*

Terpenoids are generally found to be bound to sugar moieties by a glycoside linkage. Usually they are present as glycosides in their β-D-glucosidic form. Some of the terpenes isolated from plant like betulin, oleanolic acid, clerodermic acid, betulinic acid, friedelin and monomelittoside had weak CNS activity, strong molluscicidal and fungitoxic activities (Shrivastava et al., 2007; Harbone, 1984; Mann et al., 1984).

*1.7.5. Steroids*

Steroids are terpenes based on the cyclopentane perhydroxy phenanthrene ring. Chiefly, γ-sitosterol, β-sitosterol, cholestanol, clerosterol, campesterol and 24-ethyl cholesterol were reported to be isolated from the plant (Shrivastava N. et al., 2007; Banerjee S.K. et al., 1969).

### 1.8. Pharmacological activities

- Anti-inflammatory activity
- Anti-asthmatic activity
- Anti-oxidant
- Anti-cancer activity
- Wound healing activity
- Anti-bacterial activity
- Anti-pyretic activity
- Analgesic activity
- Anti-fungal activity
- Anti-allergic activity
- Anti-microbial

### 1.9. Hepatoprotective activity

The ethanol extract of Clerodendrum serratum roots and ursolic acid isolated from it were evaluated for hepatoprotective activity against carbon tetrachloride induced toxicity in male Wistar strain rats. The rats received 20 mg/kg/day per orally of ethanol extract and 10 mg/kg/day per orally of ursolic acid concomitantly for 14 days. It revealed that the hepatoprotective activity of constituent ursolic acid extracted from roots of Clerodendrum serratum is significant as similar to the standard drug and showed more significant hepatoprotective activity than crude extract (S.M Vidya et al. 2005) [9].

Another study was carried out with the aqueous and alcoholic extract of the leaves of Clerodendrum serratum at the dose of 200 mg/kg per orally in Swiss albino mice. The results showed significant decrease in liver weight and biochemical parameters like ASAT, ALAT, SGOT, SGPT, ALP, Bilirubin, Total protein compared to control group. Thus the research provides the pharmacological evidence of ethno medicinal property of Clerodendrum serratum in treating hepatotoxicity. (Agarwal et al. 2013). [10]

### 1.10. Antioxidant activity

In DPPH radical scavenging assay, Clerodendrum serratum root at various concentrations (50, 100, 150, 200, 250µg/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, a linear increase in reducing power was observed over the concentration range 20-120 µg/ml sample, equivalent to 20 -120 µg/ml ascorbic acid.

In hydrogen peroxide scavenging assay, the inhibitive effect of CSR extract was found to be moderate when compared to other assays. The inhibition of 73.32 ± 0.002%, and 64.49 ± 0.242% was observed in ascorbic acid (standard) and ethanolic extract of root respectively at maximum concentrations. The results of the present study show that the ethanolic extract of the roots of Clerodendrum serratum Linn possess antioxidant activity through the DPPH free radical scavenging activity, reducing power assay and scavenging of hydrogen peroxide. (Bhujbal et al. 2009). [11]

In another study hydroalcoholic extract was prepared from the samples of a polyherbal drug –Bharangyadi which contained Clerodendrum serratum, Hedychium spicatum and Inula racemosa. The steroidal and anti- platelet aggregation factor studies were carried out in Swiss albino rats. The results showed that Bharangyadi compound has no endogenous steroidogenesis effect neither it has any role in platelet aggregation inhibition. As no significant change was found in the weight of adrenal gland after two week treatment with the drug, it can be concluded that the anti-inflammatory effect of the Bharangyadi compound is not due to increase synthesis of steroids. (Kajaria D K et al. 2012) [12].

### 1.11. Anticancer activity

Aqueous and methanolic extracts of roots of Clerodendrum serratum were used to study the anti-cancer activity in Swiss albino mice. Mice were treated with the extracts (100 and 200 mg/kg/day per orally) respectively for 14 days. The parameters studied were mean survival time, percentage increase in life span, body weight, hematological

parameters like RBC, WBC and Hb, biochemical investigations viz. ALAT, ASAT, Total protein. The study confirmed that the methanolic extract of the roots of Clerodendrum serratum exhibits anticancer activity at the dose of 100 and 200 mg/kg body weight (Zalke et al. 2010) [13].

### 1.12. Antinociceptive activity

Albino mice were used to evaluate the antinociceptive activity with alcoholic extract of Clerodendrum serratum roots at the dosage of 50, 100, 200 mg/kg per orally by acetic acid induced writhing and hot plate methods. Morphine sulphate (5 mg/kg, subcutaneously) was used for comparison. The result showed a significant reduction in acetic acid induced writhing, which is indicative of potent antinociceptive effect and further has been supported by hot plate method where a significant increase in AUC (area under the time response curve) was observed. The response was much less when compared to morphine sulphate. (Narayanan et al.1999) [14].

### 1.13. Anti-inflammatory activity

The alcoholic extract of roots of Clerodendrum serratum was administered to Albino rats at the concentration of 50, 100, 200 mg/kg per orally to study the ant- inflammatory activity by carrageenan induced paw edema and cotton pellet implantation methods. Standard anti-inflammatory agent phenylbutazone (100 mg/kg per orally) was used for comparison in both acute and chronic models. A potent antiinflammatory effect for Clerodendrum serratum was evidenced by the significant reduction in paw edema and cotton-pellet granuloma methods. However, the effect was less when compared to phenylbutazone (Narayanan et al, 1999) [14].

In another anti-inflammatory study aqueous extract of Clerdendrum serratum root and stem in low (90 mg/kg per orally) and high dose (180 mg/kg per orally) respectively was administered to Albino rats for ten days. The standard group received Dexamethasone p.o as a single dose daily. Both root and stem have shown the anti- inflammatory effect, but root showed significant activity in comparison with Dexamethasone (International Journal of Pharma and Biosciences, 2012) [15].

In yet another study, the methanolic extracts of aerial and root parts of Clerodendrum serratum Linn. was carried out to study the anti-rheumatic properties based on the effects on carrageenan induced paw oedema in rats. The results showed that the roots possess significant while the aerial parts exhibited moderate anti –inflammatory activity. Thus from the study it is evident that the roots of Clerodendrum serratum L. possesses potent anti-rheumatic properties (Shareef I et al. 2013) [16].

### 1.14. Anti- pyretic activity

Rabbits were treated with the alcoholic extract of roots of Clerodendrum serratum (50, 100, 200 mg/kg per orally). Paracetamol 100 mg/kg per orally was used for comparison. The reduction in pyrexia after Clerodendrum serratum administration indicated the antipyretic activity of this plant. The response at higher doses was almost comparable to that of paracetamol (Narayanan et al, 1999) [14].

### 1.15. Analgesic activity

In this study analgesic effect of the ethanolic extract of leaves of Clerodendrum serratum .Linn was evaluated at the dose of 200 and 500 mg/kg by tail flick method and acetic acid induced writhing test in Wistar rats for seven days orally and standard group rats were administered diclofenac sodium (10mg/kg per orally) one hour before study on seventh day. The drug showed significant analgesic activity when compared to standard drug (Saha et al, 2012) [17].

### 1.16. Anti-allergic activity

The present study was screened by milk induced leucocytosis in Albino mice with aqueous extract of Clerodendrum serratum root and stem in low (130 mg/kg, p.o) and high dose (260 mg/kg, p.o) respectively for fourteen days. Both root and stem have exhibited anti allergic effect but, only a high dose of Clerodendrum serratum root showed significant activity when compared with dexamethasone (International Journal of Pharma and Biosciences, 2012) [15].

In another study, chronic administration of the saponin derived from the plant (20 mg/ kg) for three weeks and for six weeks acaused a gradual increase in resistance of guinea pigs against antigen egg albumin [18].

### 1.17. Antifertility

In a preliminary screening, the 50 percent ethanolic extract of the plant (excluding root) showed a spermicidal activity in ratswhich was confirmed in the fractionated extract. The extract at two percent showed in vitro spermicidal activity

in both rat and human semen. In another study, the n-butanol soluble fraction of the fifty percent ethanolic extract of the plant (excluding root) also exhibited in vitro spermicidal activity in human semen at two percent concentration.

The acetone and methanolic extracts of the root did not exhibit anti implantation activity in rats at 150 mg/kg p.o [19].

### 1.18. Cholinesterase inhibition

The blood serum of the guinea pigs and rabbits which were treated in vivo with the saponin derived from the plant (0.3 mg/kg), exhibited anticholinesterase activity, which was found comparable to that of the standard physostigmine (0.04 mg/kg). Further, in vitro studies showed increases in percent cholinesterase inhibition with graded saponin concentration [20].

### 1.19. Antibacterial

The ether and saline extracts of the leaves exhibited antibacterial activity against Staphylococcus aureus, while they were found to be inactive against Escherichia coli. The sulphuric acid, acetate buffer and phosphate buffer extracts were inactive against both the bacteriae. The 80 percent ethanolic extract of the leaves at 25 mg/ml showed inhibition of Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus and Bacillus subtilis [21].

### 1.20. Antifungal

The aqueous extract of the leaves did not show significant effect on the mycelia growth (8 to 38.2 percent inhibition) of the keratinophilic fungi, viz., Nannizia gypsea (strain -), N. gypsea (strain +), N. incurvata (strain +), N. fulva (strain -) and N. fulva (strain +). However, it exhibited antifungal activity against Curvularia tuberculata, the causal fungus of die-back disease and Pestalotiopsis mangiferae, the causal organism of leaf spot disease [22].

### 1.21. Antihistaminic activity

The aqueous extract of the root bark (10 to 500 µg/ml) exhibited a graded inhibition of histamine responses on the isolated guinea pig ileum and tracheal chain. The ethyl acetate fraction (0.1 to 1 µg/ml) of the aqueous extract showed inhibition of histamine responses on the guinea pig ileum. The ethanolic extract of the root bark per se showed histamine release similar to that effected compound 48/80 in chopped pieces of guinea pig lung. The in vitro sensitivity of the rat lung tissue to histamine was diminished after saponin treatment for three weeks while the sensitivity to acetylcholine was not significantly changed. [23]

### 1.22. Antiasthmatic activity

The anaphylactic bronchoconstrictor response in sensitized isolated guinea pig lung was found to be inhibited after continuous perfusion of the alcoholic fraction of aqueous extract of the root of Clerodendrum serratum suggesting antiasthmatic potential [24].

### 1.23. Mast Cell Stabilization

The saponin derived from the plant caused disruption of mast cells of the rat mesentery and the maximum effect was produced in thirty minutes after which they were was no further increase. The effect was dose dependent [25].

### 1.24. *In vitro* clonal propagation

The present investigation provides a complete in vitro process, which is simple, reproducible and efficient for rapid clonal multiplication of an important rare and threatened medicinal shrub, Bharangi (Clerodendrum serratum Linn. Moon) [26].6.17

## 2. Health benefits

- Respiratory Disorders
- Digestive Disorders
- Rheumatism
- Liver Problems
- Skin Problems
- Wound Healing

**Figure 3** Used for joint pain

### 2.1. Nutritional Facts

**Table 1** Nutritional Facts

| Nutrient | Quantity per 100 g |
|---|---|
| Calories | 25 Kcal |
| Protein | 2.5 g |
| Carbohydrates | 5.0 g |
| Dietary Fiber | 1.5 g |
| Fat | 0.5 g |
| Vitamin A | 37.5 mg |
| Vitamin C | 10 mg |
| Calcium | 50 mg |
| Iron | 1.2 mg |
| Potassium | 200 mg |

## 3. Material and methods

### 3.1. Collection of materials

The various materials are collected from the various places blue glory leaves , olive oil and honey was collected from local market and aloe vera gel was collected from aloe vera plant leaf .

### 3.2. Role of ingredients and their role

*3.2.1. Blue glory leaves*

Anti-inflammatory , antibacterial agent , wound healing property

*3.2.2. Olive oil*

Anti-inflammatory

*3.2.3. Honey*

To treat burns and promote wound healing

*3.2.4. Aloe vera gel*

Boost healing of a wound reduce infection and acne

### 3.3. Preparation method

*3.3.1. Extraction of blue glory leaves*

Take 30 gram of blue glory leaves powder put in soxhlet apparatus and add sufficient amount of 500 ml of alcohol as a solvent and allowed to stand for to six hours after six hours filter and collect the extract .

*3.3.2. Preparation of herbal gel*

In water bath put a beaker add required amount of honey , aloe vera gel , blue glory leaves extract and olive oil stirred it continuously upto 10 to 15 minutes to form a homogeneous mass of a gel .

**Table 2** Formulation Table

| INGREDIENT | QUANTITY |
|---|---|
| Leaves extract | 3 ml |
| Olive oil | 1.5 ml |
| Honey | 2 drops |
| Aloe vera gel | 8 gram |
| Sodium benzoate | 0.05 gram |

**Table 3** Evaluation parameters of herbal gel formulation

| TEST | FORMULATION |
|---|---|
| Colour | Green |
| Texture | Smooth |
| pH | 7.75 |
| Viscosity | 0.37 poise |
| Skin irritation test | No itching or inflammation |
| Spreadibility | Easily spread |

## 4. Conclusion

The all u ingredients which used in the formulation are giving maximum therapeutic effect and minimum or no adverse effect to the body . because of the all ingredients are as natural products which are helpful and effective to the wound healing . To studied the all the perspectives the herbal gel was found to be natural product and living for the long period of time to use.

## Compliance with ethical standards

*Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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