

REVIEW ON *CLERODENDRUM INERME*Chethana G.S<sup>1</sup>, Hari Venkatesh K.R.<sup>2</sup>, S.M Gopinath<sup>3\*</sup><sup>1</sup>Research Associate, Sri Sri Ayurveda, Bangalore, Karnataka, India<sup>2</sup>Head, R & D, Sri Sri Ayurveda, Udayapura, Bangalore, Karnataka, India<sup>3\*</sup>HOD, Department of Biotechnology, Acharya Institute of Technology, Bangalore, Karnataka, India

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## ABSTRACT

*Clerodendrum inerme* is a hedge plant belongs to the Verbenaceae family, traditionally used for ornamental purpose in home gardens. In the present study, anti-bacterial effect of ethyl acetate, ethanol, methanol extract of *Clerodendrum inerme* was evaluated against the microbes *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Bacillus cereus*, *Klebsiella pneumoniae*, *E.coli* by well diffusion, disc diffusion, Minimum Inhibitory Concentration. The anti-bacterial activity of ethyl acetate leaf extracts exhibited was found to be significant. There are coincidences between some of the traditional usages of this plant and experimentally observed effects of the extracts but very few biological studies available on bioactive fractions and/or pure compounds therefore, This review is an attempt to compile the exhaustive literature on *Clerodendrum inerme*, to create the awareness of this plant which is having potential activities in many biological aspects which will be boon to the mankind systematic way.

**Keywords:** *Clerodendrum inerme*, Anti-bacterial, Disc diffusion

## INTRODUCTION

### The review of the *Clerodendrum inerme* in the pharmacological aspect

In the present situation, plants have got the attraction in wide variety of application mainly in medicinal field. *Clerodendrum inerme* occurs predominantly in the mangrove forests of coastal India, exposed to wide range of fluctuations in salinity. They have an advantage over other species that lack strategies to deal with salt in the soil and thus are excellent competitors in saline environments<sup>1</sup>. This plant is rich in a wide variety of secondary metabolites such as tannins terpenoids, alkaloids, flavonoids, etc, which have been found in vitro to have antimicrobial properties<sup>2</sup>. It has a wide range of biological activities as we discuss further in this article.



## Taxonomy

**Family:** Verbenaceae.

**Taxonomic notes:** The genus *Clerodendrum* includes over 450 species of tropical regions. **Nomenclature:** The name *Clerodendrum* is derived from the Greek *kleros*, meaning chance or fate, and *dendron*, meaning tree, in reference to the uncertain medicinal qualities of some of the plants.<sup>3</sup>

**Habitat:** Throughout India in tidal forests, wild all over coastal areas; planted in gardens in Tamil Nadu.

## Vernacular names

English : Smooth Volkameria.

Ayurvedic : Putigandhaa, Kundali, Vanajai.

Siddha/Tamil: Peenaari, Sangakuppi.

Folk : Lanjai.<sup>4</sup>

**Description:** Evergreen sprawling shrub 1-1.8 m tall. Stems woody, smooth. Leaves ovate to elliptical (5-10 cm) long, acute to acuminate tip, green, smooth, slightly shiny upper surface, pinnate venation, margins entire, leaves opposite, simple. Cyme or umbel usually comprised of 3 flowers joined at a common base point; corolla white, fused, with 5 lobes; stamens 4, reddish to purple and upwardly curved. Fruit green turning black, 1 to 1.5 cm long, obovoid.<sup>5,6</sup>

**Biology & Ecology:** *Clerodendrum inerme* is valued in landscaping as a groundcover or hedge plant. It has attractive evergreen foliage and fragrant white flowers that form in clusters and are accented by delicate red protruding stamens. Seaside *Clerodendrum*, as its name suggests, grows well along the beach tolerating the salt spray of the ocean and the harsh rays of the sun. It is a versatile plant and can be grown as topiary or as a bonsai.<sup>7,8</sup>

## Chemical Constituents

Tested for surface protectants of seeds against insects, biotoxicity on fingerlings of fish, toxicity against mosquito larvae, anti bacterial and antiviral activity. The chemical constituents are carboxylic acids, diterpenes, flavonoids, hydrocarbons, iridoid biglycoside, neolignans, phenols, protein, steroids, triglycerols, triterpenes<sup>9</sup>, quinine, Verbascoside<sup>10</sup>, ursolic acid<sup>11</sup>.

The roots are prescribed in venereal diseases. The methanolic extract of the roots contains verbascoside which exhibits analgesic and antimicrobial properties. The leaves and stem contain a number of triterpenes, neolignans, diterpenoids, sterols and flavones.<sup>12</sup>

Pharmacological activities of *Clerodendrum inerme*

## Anti microbial Activity

The petrol extract, Benzene extract of the plant was found to be effective against gram positive and gram negative pathogenic bacteria. Ethyl acetate and Methanol fraction of

the plant was found to be effective against all the tested gram positive bacteria while they were found inactive against three of the gram negative bacteria. (Commonly tested on *Pseudomonas aeruginos*, *Salmonella typhi*, *Shigella dysenteriae*). The crude leaf extract (Aqueous extract) of the plant was effective against many of the tested pathogens<sup>13,14,15</sup>.

#### Anti nematocidal Effects

To evaluate extracts of *Clerodendrum inerme* for their nematocidal efficacy against root knot nematodes, the juvenile mortality assay against egg masses by the leaf extracts of *Clerodendrum inerme* showed significant effect on inhibiting the development<sup>16</sup>.

#### Anti hepatotoxic Activity

The effect of the extract of *Clerodendrum inerme* on serum enzymes in rats treated with the hepatotoxic agent carbon tetrachloride was studied. Carbon tetrachloride destroys hepatocytes and interferes with cellular metabolism and transportation thereby elevating the level of serum enzymes such as alanine aminotransferase (ALT), alkaline phosphatase (ALP), aspartate aminotransferase (AST) as well as serum triglycerides and cholesterol. The ethanolic extract of *Clerodendrum inerme* produced a significant decrease in the levels of the serum enzymes ALT, AST, ALP as well as triglycerides and cholesterol as compared to CCl<sub>4</sub> treated groups<sup>17</sup>.

The leaves and stems contain a number of triterpenes, diterpenoids, sterols and flavones. The leaves yielded the flavanolid, friedelin, salvigenin (5-hydroxy-6, 7, 4'-methoxy flavones), acacetin, cirsimaritin, pectolarigenin, apigenin(5,7-dihydroxy-4' methoxy flavaone) and amethyl flavones, cleroflavone (7-hydroxy 5,4' dimethoxy-6-methyl flavanone). The leaves also yielded diterpenes clerodendrin B. the leaves exhibited growth inhibition and antifeedant activities in house flies and mosquitoes.<sup>18</sup>

#### Inhibition of the development of the Mosquito Vector for Many Diseases

It is clearly studied that the *Clerodendrum inerme* interfered with developmental processes of the fourth instar larvae and pupae of *Aedes aegypti*. In this context, the observations that exposure of fourth instar mosquito *Culex quinquefasciatus* to ether extract of *Clerodendrum inerme* leaves resulted in death at larval-pupal molt and pupal-adult eclosion and suggesting inhibition of the moulting process lend further support the observations. *Clerodendron inerme* plant extracts showed mosquitocidal activity on the three species of mosquito vectors namely malarial vector, *Anopheles stephensi*, dengue vector *Aedes aegypti* and filarial vector, *Culex quinquefasciatus*<sup>19</sup>.

#### Medicinal Importance

The plant is used as febrifuge, antiperiodic and as a substitute for quinine in remittent and intermittent fevers. In Andhra Pradesh, leaves pounded along with camphor, garlic and pepper are applied on oedema of legs. The leaves warmed in sesame oil and pounded with garlic and perrper are applied in elephantiasis. The leaf juice is taken orally to relieve muscular pains and stiffness of legs (in tetanus). The extract of pounded leaves with pepper and asafoetida are made into a fine paste and given orally to cattle in rhematic pain and

arthritis. The leaves and roots are also used for treating rheumatism and skin diseases.<sup>20</sup>

*Clerodendron inerme* as a febrifugal and uterine stimulant, a pest control agent and antiseptic, to arrest bleeding, treatment of asthma, hepatitis, ringworm, stomach pains<sup>21</sup>. *Clerodendrum inerme* Leaf is ground in water and the juice is taken orally to treat fever<sup>22</sup>. It is an important medicinal plant reported to be used in the treatment of skin diseases, venereal infections, elephantiasis, asthma, topical burns and for rheumatism. It is also used as substitute of quinine. In Siddha medicine, it is used under the names of 'Chankan kuppi' and 'Pechagnan'. A glycoside ester namely Verbascoside has been isolated from the root of this plant, which has analgesic and antimicrobial properties. The antioxidant activity of the plant extract may be due to the presence of polyphenols which are reported as strong antioxidants<sup>23</sup>. *Clerodendrum inerme* has been reported to have significant antinociceptive activity which might explain its use for rheumatoid arthritis, which has quite intensive pain as one of its symptoms<sup>24</sup>.

The dried flowers yield the free sugars, galactose, sucrose and fructose and the free amino acids, lysine, arginine, serine, proline, threonine, glutamic acid. The fruits are prescribed to check fertility. The methanolic extract of roots contains verbanoside. It possesses analgesic and antimicrobial properties conforming to the use of the plant in traditional medicine. the roots also prescribed for vulnerable diseases.<sup>25</sup>

The leaves of *Clerodendrum* spp. are reported to contain several essential oils. These are exploited in traditional medicine and are useful in the chemotaxonomical identification of the genus. Previously several constituents have been isolated from *C. inerme*: Inerminoside-A1, Inerminoside-C, Inerminoside-D, 3-Iridoid Glycosides, Inerminoside-DB, 4 $\alpha$ -Methyl-24 $\beta$ -ethyl-5 $\alpha$ -cholesta-14, 25-dien-3 $\beta$ -ol and 24 $\beta$ -Ethylcholesta-5, 9[11], 22E-trien-3 $\beta$ -ol, Sterols and Megastigmane Glycosides. (Sammangaosides A and B).<sup>26</sup>

The medicines of *Clerodendrum inerme* is known for its folk medicines which complies with the modern medicinal research. it has mainly the phytochemical constituents like alkaloids, flavanoids, terpenes, diterpenes, triterpenes which are responsible for anti microbial, anti nematocidal etc. It has tremendous activity as a medicine in the acting as antimicrobial agent in the field of microbiology. This plant has wide application in the medicinal field. Further studies are to be carried out to bring the medicinal qualities from this plant in treating many diseases.

#### CONCLUSION

*Clerodendrum inerme* is used in many places in landscaping, as a ground cover or a hedge plant, especially near the sea, as it tolerates the salt spray. It does, however, have aggressive growth characteristic, and is likely to become invasive in areas where it does not naturally occur, but where it has been planted. There are signs of this happening in parts of Hawaii. It has the potential to form dense brambles smothering other plants, and would probably be difficult to remove.

From the above review on *Clerodendrum inerme*, we can conclude how important the medicinal effects of this plant. There is coexistence between some of the traditional usages of this plant like applying on the wounds etc and experimentally observed effects of the extracts as mentioned above but very few biological studies available on bioactive components of this plant.

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