A Comprehensive insight into the phytocomponents and health benefits of *Clematis* species

**Somesh Thapliyal**
Department of Pharmaceutical Sciences. Hemvati Nandan Bahuguna Garhwal University, (A Central University) Srinagar Garhwal, Uttarakhand.

**Hemlata Sati**
Department of Pharmaceutical Sciences. Hemvati Nandan Bahuguna Garhwal University, (A Central University) Srinagar Garhwal, Uttarakhand.

**Bhawna Sati**
Department of Pharmacy, Banasthali Vidyapith, Rajasthan.

**ABSTRACT**

The genus of *Clematis* is a buttercup family (Ranunculaceae), recognized for its flowers and adaptable as an ornamental plant in colder climates. It contains around 300 species. *Clematis* has a variety of active phytocomponents or secondary metabolites which are responsible for health benefits in human beings. Traditionally various species of the *clematis* genus used for centuries to treat various ailments including syphilis, bone disorders, gout, rheumatism, diuretics, wound healing, blood sugar control, blood diseases, spleen difficulties, leprosy, fevers, skin diseases. A systematic review of scientific electronic database and reference books were consulted to find all relevant literature for this work. This review discusses the ethnomedicinal usage, health advantages, phytocomponents and bioactivities of *clematis* species.

**Introduction**

Plants have served millions of people for centuries as their primary health care (Gakuya et al., 2020). The majority of medicines used to cure ailments in various systems of traditional medicine are based on plants and their phytocomponents. Secondary metabolites in plants not only participate in their endurance by producing attractants for pollinators, but also act as chemical defenses against herbivores and disease (Yanqun et al., 2020). Traditional medicines are used in Ayurveda, Siddha, Unani and Homeopathic practice for healthiness and to diagnose, treat, and prevent physical or mental-related health problems (Salmerón-Manzano et al., 2020). Plant-based remedies apply various source materials including roots, leaves, bark, fruits, essential oil, etc (Ekpo et al., 2008; Rasool Hassan, 2012). The genus *Clematis* encompasses more than 300 taxonomically accepted species within the Ranunculaceae family; which are widely distributed throughout temperate as well as tropical regions worldwide, especially beyond the tropics in the northern hemisphere. Plants of the *Clematis* genus are woody, climbing vines (Kaur et al., 2020). Various plant parts of the *Clematis* genus are used traditionally to treat gout, bone disorders, syphilis, rheumatism, diuretics and skin disorders (Alvarez et al., 2003). It is also used to treat purulent wounds and ulcers. Biologically antibacterial, cytototoxicity (Ding et al., 2009), antimycotic (Buzzini Pieroni, 2003), anticancer (L.-H. Yan et al., 2009), anti-inflammatory (Park et al., 2006), antifungal activity showed by active phytocomponents or secondary metabolites present in the plants of the *clematis* genus (Y. Li et al., 2009). Many secondary metabolites of *Clematis* genus, including alkaloids, glycosides, and saponins, have good therapeutic properties (Duke, 1985; Kingsbury, 1964; Turner Szczawinski, 1991). The scientific community will hopefully benefit from the knowledge gained from geographical, botanical, phytochemical, therapeutic

---

**Corresponding author E-mail:** Somesh.thapliyal1979@hnbgu.ac.in  
**DOI:** [https://doi.org/10.36953/ECJ.24482653](https://doi.org/10.36953/ECJ.24482653)  
This work is licensed under Attribution-Non Commercial 4.0 International (CC BY-NC 4.0) © ASEA
and pharmacological perspectives to plan safer tests with bioactive mixtures.

**Material and Methods**

Scientific electronic databases and reference books were used to find all relevant literature for this work. Several databases, including “Plant List” and “Plants of the World Online”, confirmed the plant's scientific name.

**Results and Discussion**

**Botanical information**

There are more than 300 species of vines that bear flowers in the genus *Clematis*, which is a segment of the buttercup family (Ranunculaceae); known for their flowers, they are adapted as ornamentals in colder climates. Woody climbers of the genus *Clematis* produce stunning, huge flower clusters that are often white; however, some species also produce crimson or violet flowers. More than 70 species are used traditionally in China (Ding et al., 2009). *C. virginiana, C. cirrhosa, C. vitalba, and C. viticella* are some common species. *C. virginiana* (Old Man's Beard) is a trailing climber that usually provides shady shelter as it can grow up to 15 m taller than other plants; this species is native to North America. The leaves of the vine are opposite and divided into leafstalk and leaflets. Some species are shrubby like *C. recta* (European species), and creamy white flowers present bloom during July to September (Duke, 1985) (Ody, 1993).

**Traditional medicinal uses**

A well-known plant in the *Clematis* genus is *C. montana* of the Ranunculaceae family; found primarily in India, although it is also available in Pakistan, Nepal, Bhutan, and China. In North India, it is commonly known as Garol, Geor Bel, Kanguli, Kaunie-Bali. In Germany it is known as Berg-Walrebe; bjerg-skovranke in Danish; Himalayan clematis, Anemone clematis in English. This species is used in many nations to cure a variety of diseases and disorders because of its exceptional healing powers. This plant is traditionally used against various diseases such as syphilis, bone diseases, gout; rheumatism, diuretic and skin diseases (Rana et al., 2015). The well-known perennial herb from East Asia is called *Clematis gouriana*. Locals use it extensively for wound healing, blood sugar control, blood diseases, spleen problems, leprosy and fevers; and herbal cream of leaves extract prepared to treat skin infection (Sheela, 2014). By inhaling the fumes of freshly crushed leaves, *C. glycinoids* DC. has long been used in Australia to relieve headaches and colds (R. W. Li et al., 2003). *C. pickeringii* is used to treat respiratory problems, joint pain, fever, edema, infection, snakebite and other inflammatory diseases (Muthaura et al., 2007). In Kenya, *C. brachiata* is broadly used in headaches, malaria, abdominal pain, skin disorders, toothaches, and sore throats. The whole flowering plant of *C. dioica* is used in Guatemala to treat gonorrhea (Caceres et al., 1995). According to popular folklore in Turkish *C. flammna* flowering herbs are used as an anti-inflammatory remedy, such as for rheumatism, and to reduce fever (Yeşilada et al., 1997). Roots of *C. mandshurica* native to Korea are used to treat arthritis problems (Park et al., 2006). *C. terniflora* and *C. chinensis* roots are regarded as a substitute for traditional Chinese drugs like analgesic, diuretic, antitumor, rheumatic arthritis, laryngitis, skin and breast infection (Xu et al., 1996). The root extract of *C. chinensis, C. mashurica* are used traditionally to treat joint pain. In China and the north of Burma, *C. armandii* is used to treat gynecological diseases and dermatoses. *C. chinensis* is a deciduous climber native to China, Japan, Taiwan and Vietnam; possesses health benefits and clinically, it is used in cardiovascular and cerebrovascular diseases, rheumatoid arthritis, ischemic necrosis of bone, osteo-hyperplasia and protrusion of intervertebral disc, bone disease and fracture (Shi et al., 2007). *Clematis gouriana* is a woody climber found in tropical and subtropical forests of India, Nepal, and China; widely used for malaria, headache, psoriasis, wound healing and skin problems (Naika Krishna, 2007). *C. apifolia* DC. is well-known plant in South Korea, Japan, and China. In Korean traditional medicine this plant species is reported to be used in neuralgia, facial paralysis, rheumatoid arthritis, and toothache (Lee et al., 2019). *C. aethusifolia* Turczb is a Mongolian medicinal plant; its leaf and stem are extensively used to care for joint pain, vomiting, and indigestion (Shi et al., 2007). *C. lasiandra* native to China used in their traditional system of medicine due to its antitoxic, diuretic, analgesic, and antipyretic action (Tian et al., 2013). Leaf extract of *C. chinensis* Osbeck has been widely used in joint pain, and sore throat in China (C. Peng et al., 2012).
C. *florida* Thunb is used to treat rheumatic arthritis, diuretics, stomachache, and jaundice in China (Feng Zhang). The roots of *C. henryi* Oliv are used traditionally to treat gout, and arthritis in Tujja (Sun et al., 2016).

**Phytoconstituents of the Genus Clematis**

Nowadays, phytopharmaceuticals play an important role in geomedicine, plant science, food science, cosmetics industry, nano-life science, pharmacology, toxicology, agro chemistry and so on. Isoprenoids compounds, alkaloids, glycosides, volatile oils, steroids, organic acids, and phenols are the diverse ingredients found in the plants of *Clematis* genus; triterpenoid saponins, flavonoids and their glucosides, and lignans are the primary constituents present in plant species of *Clematis* genus (Table 1). Bidesmosidic saponins of the oleanolic and hederagenin types are the major triterpenoid saponins present in *Clematis* species. Flavones, flavonols, flavanones, isoflavones, xanthones are the major flavonoids present in *Clematis* genus. Eupomatene lignans, cyclolignans, monoepoxy lignans, bisepoxy lignans, and lignanolides make up the majority of the lignans in *clematis* (F. Sun Yang, 2009).

**Table 1: List of chemical constituents of various Clematis species**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Clematis species</th>
<th>Chemical Constituents</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>C. parviloba</em></td>
<td>Aporphine alkaloids: α-magnoflorine and β-magnoflorine. Phenolic glycosides: 2-(E)-3-carboxybut-2-enyl-4-hydroxy-3-methyl-phenyl-O-beta-D-glucopyranoside, 4′-hydroxy-3′-methoxy-phenol-beta-D-[6-O-4″-hydroxy-3″,5″-dimethoxy-benzoate], glucopyranoside, clemaparviloside A. Megastigmane glycosides: Linarionoside A, B, &amp; C, staphylionoside. Lignan: Syringaresinol, medioresinol.</td>
<td>(Chen et al., 2009; L. H. Yan et al., 2009; Yan et al., 2008; Yan et al., 2010)</td>
</tr>
<tr>
<td>3.</td>
<td><em>C. hirsuta</em></td>
<td>Sterols and Terpenes: β-Amyrin, lupeol, β-sitosterol, oleanolic acid, stigmasterol, (S)-(++)-dihydro-5-(hydroxymethyl)-2(3H)-furanone and (S)-(−)-5-hydroxyethyl-2(5H)-furanone, anemonin, dihydro-4-hydroxy-5-(hydroxymethyl)-2(3H)-furanone (2-deoxy-D-ribo-1,4-lactone), biophenol, glucose and sucrose.</td>
<td>(Abdel-Kader et al., 2008), (Ameya et al., 2022)</td>
</tr>
<tr>
<td>5.</td>
<td><em>C. armandii</em></td>
<td>Lignan: (7R, 8S)-9-acetyl-dehydrodiconiferyl alcohol. Flavonane glycoside: 5, 4′-dihydroxy-3′-methoxyflavanone-7-(6″-O-β-L-rhamnopyranosyl)-β-D-glucopyranoside.</td>
<td>(Yan et al., 2007)</td>
</tr>
<tr>
<td>No.</td>
<td>Species</td>
<td>Phytoconstituents</td>
<td>References</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7.</td>
<td><em>Clematis delavayi var. spines cens</em></td>
<td>7-hydroxy-4,6-dimethoxy-5-methylcoumarin, (E)-para-cumatic acid, coniferaldehyde, 4,6,7-trimethoxy-5-methylcoumarin.</td>
<td>(Y. Li et al., 2009)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Wei et al., 2022)</td>
</tr>
<tr>
<td>10.</td>
<td><em>C. heracleifolia</em></td>
<td>Heracleifolianosides.</td>
<td>(Du et al., 2003; Q. Zhang et al., 2022)</td>
</tr>
<tr>
<td>11.</td>
<td><em>Clematis lasiandra</em> Maxim</td>
<td>3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl- (1→2)[β-D-glucopyranosyl(1→4)]-β-D-xylopyranosyl hederagenin , 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl- (1→2)-β-D- xylopyranosyl oleanolic acid 28-O-β-D-glucopyranosyl ester, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-xylopyranosyl hederagenin, and 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl ester, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl ester, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl ester.</td>
<td>(Tian et al., 2013)</td>
</tr>
<tr>
<td>12.</td>
<td><em>Clematis chinensis</em></td>
<td>Clematochinenoside H-K, mandshunoside-B, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)[β-D-glucopyranosyl(1→4)]-α-L-rhamnopyranosyl oleanolic acid28-O-α-L-rhamnopyranosyl(1→4)-β-D-glucopyranosyl(1→6)-β-D-glucopyranoside, 3-O-β-D-ribopyranosyl-(1→2)-α-L-rhamnopyranosyl hederagenin 28-O-α-L-rhamnopyranosyl(1→4)-α-L-rhamnopyranosyl(1→6)-β-D-glucopyranoside, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl ester, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl ester, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl ester, 3-O-β-D-ribopyranosyl-(1→3)-α-L-rhamnopyranosyl-(1→2)-β-D-glucopyranosyl ester.</td>
<td>(Fu et al., 2017)</td>
</tr>
<tr>
<td>13.</td>
<td><em>Clematis ganpiniana</em></td>
<td>Clematiganoside-A , 3β-[(α-L-arabinopyranosyl)-oxy]olean-12-en-28-oic acid, hederagenin 3β-O-α-L-arabinopyranoside, 3β-O-α-L-rhamnopyranosyl-(1→2)-α-L-arabinopyranosyl oleanolic acid , α-hederin.</td>
<td>(Ding et al., 2009; F. Sun et al., 2007)</td>
</tr>
<tr>
<td>15.</td>
<td><em>Clematis Gouriana</em></td>
<td>Alkaloids, carbohydrates, steroids, saponins, tanins, flavonoids, phenolic compounds, and terpenoids.</td>
<td>(Sheela, 2014)</td>
</tr>
<tr>
<td>16.</td>
<td><em>Clematis parviloba</em></td>
<td>Aporphine alkaloid: β-magnoflorine, α-magnoflorine.</td>
<td>(Chen et al., 2009)</td>
</tr>
<tr>
<td>17.</td>
<td><em>C. orientalis</em></td>
<td>Resorcinol</td>
<td>(Karimi et al., 2018)</td>
</tr>
<tr>
<td>18.</td>
<td><em>C. ispahanica</em></td>
<td>Ellagic acid</td>
<td>(Karimi et al., 2018)</td>
</tr>
<tr>
<td>19.</td>
<td><em>Clematis grata</em></td>
<td>Clematoside-S,hederagenin-3-O-β-f-ribopyranosyl (1→3)-α-L-rhamnopyranosyl(1→2)-α-L-arabinopyranosyl.</td>
<td>(Sati et al., 1990)</td>
</tr>
</tbody>
</table>
**Conclusion**

*Clematis* species are widely used around the world for their known health benefits. They have analgesic, diuretic, anti-cancer and anti-rheumatic properties. These numerous biological activities are carried out by various chemicals, the main components of which include saponins, flavonoids, and lignin and ranunculin glycosides. *Clematis* has great potential for human health and its medicinal effects should be studied more closely and thoroughly. There is a need for preclinical and clinical research into the use of these plants, as well as more detailed studies of all bioactive phytoconstituents and their mechanisms at the cellular and tissue levels.

**Acknowledgement**

The authors thank all authors whose work was cited in literature survey.

**Conflict of interest**

The authors declare that they have no conflicts of interest.

**References**


Kaur, K., Kaur, A., & Thakur, S. (2020). Use of medicinal plants in traditional health care practices: A case study in Talwandi...


Publisher’s Note: The ASEA remains neutral with regard to jurisdictional claims in published maps and figures.