# CONSERVATION AND MEDICINAL APPLICATIONS OF TRILLIUM GOVANIANUM.: A REVIEW

**Ankita Thakur[1], Kalpana Thakur[2], Pratima Bhatiya[3],Sunidhi Verma[4], Muskan Verma[5]**

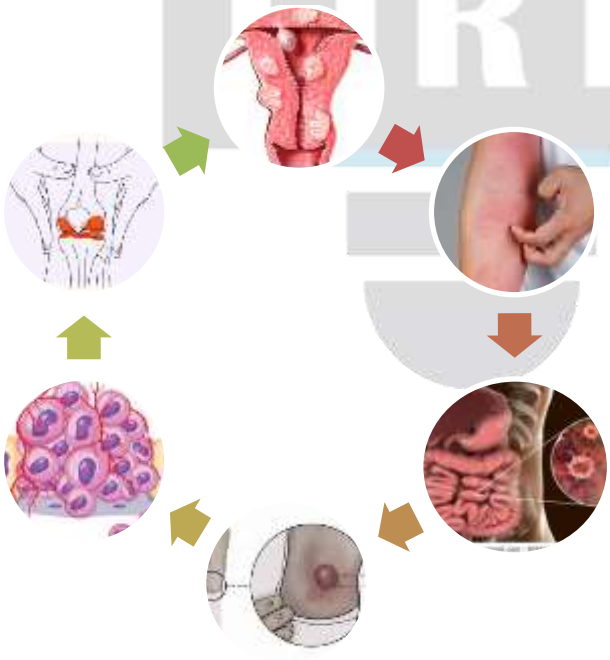
Department of Ayurveda, Yoga and Naturopathy, Career Point University, Hamirpur[1]

ankitathakur0402@gmail.com[1], kalpnathakur077@gmail.com[2], pratimabhatiya@gmail.com[3] , s913934@gmail.com[4], muskanbaijnath007@gmail.com[5]

**Abstract:** *Trillium govanianum*, also known as "Nag Chhatri," "Himalayan Trillium," or "Birthroot," is a perennial herb from the family Trilliaceae (formerly Melanthiaceae). It is native to the Himalayan region, flourishing at elevations of 2,700 to 4,000 meters, and is recognized for its trifoliate leaves and distinctive flowers, which range in color from deep red to greenish hues. As an endangered species, it plays a critical role in the region's ecological balance, highlighting the need for its conservation. The rhizomes of Trillium govanianum have been traditionally used in herbal medicine to address various health conditions such as boils, diarrhea, inflammation, menstrual and reproductive health issues, and wound healing. Additionally, its therapeutic applications extend to serious diseases, including cancer, hypertension, arthritis, dysentery, and sepsis. The plant's extensive medicinal properties underline the urgency of its preservation to support biodiversity and ensure its continued availability for therapeutic uses.

**Keywords:** Trillium Govanianum, Himalayan, Hypertension, inflammation.

## GRAPHICAL REPRESENTATION



## 1. INTRODUCTION

Medicinal herbs play a crucial role in traditional medical systems, particularly in developing nations, where approximately 80% of the population depends on these practices for healthcare needs[1].Among the diverse array of medicinal plants, the genus Trillium holds significant importance due to its extensive therapeutic properties. Species of Trillium are distributed across the western Himalayas, Japan, China, Kamchatka (Russia), and North America, with many renowned for their steroidal saponins [2-3]. The phytochemical profile of Trillium includes a variety of bioactive compounds such as flavonoids, sterols, terpenoids, glycosides, and sapogenins, which contribute to its pharmacological properties [4-5].

One notable species, *Trillium govanianum*, commonly referred to as "Nag Chhatri" or "Teen Patra," is endemic to the Himalayan region. Belonging to the family Melanthiaceae (alternatively Trilliaceae), this herb is easily recognized by its trifoliate leaves, three-petaled flowers, and three sepals—features that inspired its genus name derived from the Latin and Greek term "tri," meaning "three." *T. govanianum* typically grows in shaded, moist environments such as forests, grasslands, and hill slopes, preferring rich, dark soils at altitudes ranging from 2,500 to 4,000 meters [6-7].

Traditionally, *T. govanianum* has been highly valued for its medicinal properties. The plant's rhizome is rich in trillarin, a compound that hydrolyzes to produce diosgenin, which serves as a precursor in the synthesis of steroidal and sex hormones[8]. This herb has gained commercial prominence in recent decades due to its application in the treatment of various ailments, particularly its effectiveness against cancer, earning it the reputation of an "anticancer" herb. In folk medicine, its rhizomes have been employed to treat conditions such as boils, dysentery, inflammation, menstrual disorders, sexual health issues, wounds, and as an antiseptic [9-11].

**Fig. 1**. Trillium Govanianum

## 2. SCIENTIFIC NOMENCLATURE AND COMMON NAMES OF TRILLIUM GOVANIANUM

**Table 1**Scientific Nomenclature [12]

| | |
|---|---|
| Synonym | *Trillidium govanianum* (Wall. ex D.Don) Kunth |
| Scientific Name | *Trillium govanianum*Wall.exD.Don |

**Table 2** common names of trillium Govanianum

| Sr. No | Common names | |
|---|---|---|
| 1. | English | Himalayan Trillium |
| 2. | Chinese | Xi Zangyan Ling Cao |
| 3. | Hindi | Chota Satwa |
| | | Nagchatri |
| | | Teen Patra |

## 3. CLASSIFICATION

**Table 3** Taxonomical and Botanical Classification of *Trillium govanianum*

| **Taxonomical classification**[13] | | | **Botanical classification**[14] | | |
|---|---|---|---|---|---|
| 1 | Kingdom | Plantae | 1 | Kingdom | Plantae |
| 2 | Subkingdom | Tracheobionta | 2 | Division | Magnoliophyta |
| 3 | Clade | Tracheophytes | 3 | Phylum | Tracheophyta |
| 4 | Clade | Angiosperms | 4 | Class | Liliopsida |
| 5 | Clade | Monocots | 5 | Subclass | Liliidae |
| 6 | Order | Liliales | 6 | Order | Liliales |
| 7 | Family | Melanthiaceae | 7 | Family | Melanthiaceae |
| 8 | Genus | Trillium | 8 | Genus | Trillium |
| 9 | Species | T. govanianum | 9 | Species | T. govanianum |

**Table 4** Morphological Characters [15-1ss7]

| S.No | Part use | Morphology | Characteristics |
|---|---|---|---|
| 1. | Rhizome | The rhizome is short, stout, and woody, with a diameter of 1-2 cm.. | **1.Growth Habit** Trillium govanianum is a slow-growing, shade-loving perennial. |
| 2. | Stem | The stem is erect simpleand glabrous growing up to 30-60 cm tall. | **2.Flowering and Fruiting** The plant flowers in May-June and fruits in July-August. |
| 3. | Leaves | Leaves are trifoliate (three-leafleted), with each leaflet being ovate-lanceolate. The leaves are dark green, glabrous, & have a petiole of 2-5 cm. | |
| 4. | Flowers | Flowers are solitary, terminal, and white, with three petals and three sepals. The petals are obovate | **3. Cultivation** Trillium govanianum can be cultivated in well-drained, acidic |

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|---|---|---|---|
| 5. | Fruits | Fruita arered, fleshy & ellipsoidal containing several seeds. | soil and partial shade, and careful handling to avoid damaging the rhizome |
| 6 | Seeds | Seeds are small, brown, and irregularly shaped, with a smooth surface. | |

**Table 5** Chief Constituents, Plant Parts, and Therapeutic Efficacy of *Trillium govanianum*

| S.no | Chief constituents | Plant part | Therapeutic efficacy |
|---|---|---|---|
| 1. | Diosgenin[18] | Rhizome | • Anti inflammatory<br>• immunological activity<br>• anti-thrombotic.<br>• Anticancer |
| 2. | Pennogenin[19] | Rhizome | • Antifungal activity<br>• Anti tumor. |
| 3 | Govanoside[20] | Rhizome | • Anti inflammatory,<br>• Anticancer,<br>• Antifertility<br>• Antileishmanial<br>• Antioxidant<br>• Anti microbial<br>• Antidiarrheal<br>• Aantipasmodic |
| 4. | Borososside E[21] | Rhizome | • Antifungal activity . |
| 5 | Trillarin[22] | Rhizome | • Anti inflammatory<br>• Antioxidant<br>• Cytotoxic activity<br>• Immunomodulatory activity . |

## 4. GEOGRAPHICAL DISTRIBUTION

***Trillium govanianum***, commonly known as Naag Chatri, is a perennial herb native to the Himalayas, found in India, Nepal, Bhutan, and parts of China. It thrives in deciduous and coniferous forests at elevations ranging from 2,000 to 4,000 meters above sea level. The plant is primarily located in the foothills of the Himalayas, particularly in the northern Indian states of Jammu & Kashmir, Uttarakhand, Himachal Pradesh, and parts of Madhya Pradesh, Uttar Pradesh, and Bihar. Naag Chatri grows in moist, shady environments, often near riverbanks or within forest undergrowth. It is adaptable to various soil types but prefers regions with well-drained soil and good water.[23]

**Table 6** Species Names, Common Names/synonyms, Native Place, Morphology and figures name of *Trillium govanianum*

| Species Name | Commonnames/ Synonyms | Native place | Morphology | Figures Name |
|---|---|---|---|---|
| *Trillium albidum* | 1.White wakerobin<br>2.white toadshade<br>3.Sweet Trillium | Washington to California | Perennial herb has three broad, ovate leaves (Bracts), and a large white flower that turns pink with age. |  <br>***Fig. 2.*** *Trillium Albidum*[24,27] |
| *Trilliumcamschacense* | T.palllasi | East Asia, Grows in Japan ,Korea China. | Perennial herbs. Having white color flowers. |  <br>***Fig. 3.***<br>*TrilliumCamschacense*[25,28] |
| *Trilliumchannellii* | _ | Hokkaido in Northern Japan | With its underground rhizome, this plant thrives mostly as a perennial herb. This plant features white blossoms and tall, elliptic, wide leaves. |  <br>***Fig. 4.*** *Trillium channellii*[26,29] |
| *Trillium chloropetalum* | 1.CommonTrillim.<br>2.Giant Trillium.<br>3.GiantWake Robin.<br>4.Sessile Trillium. | California. | Perennial flowering plant that blooms in the spring with maroon flowers |  <br>***Fig. 5.*** *Trillium chloropetalum*[30] |

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| *Trillium decipien* | Deceiving Trillium. | Florida and Georgia. | The three purple, brown, or green (and occasionally yellow) petals of the flower stand erect at the intersection of the three remarkably mottled leaves. It is among the first trilliums to bloom, usually in January or February. |  ***Fig. 6.*** *Trillium decipien*[31] |
| *Trillium decumbens* | 1.Trailing Wakerobin 2.Trailing Trillium | Northern Georgia | It is a perennial plant with dark purple fruit, mottled green and bronze leaves, and darker maroon or purple blooms. |  ***Fig. 7.*** *Trillium decumbens*[32] |
| *Trillium discolor* | 1.T. sessile 2.T. luteum. 3.Faded Trillium | Georgia,North Carolina & South Carolina. | The perennial herb has a pale yellow blossom that stands upright at the intersection of three leaves. |  ***Fig. 8.*** *Trillium discolor*[33] |

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|---|---|---|---|---|
| *Trillium erectum* | 1.Wake-Robin,<br>2.Red Trillium<br>3.purple Trillium<br>4.Beth root<br>5.stinking Benjamin | North America. | This perennial herb has three pointed leaves and bright crimson blossoms or white flowers. |  <br>***Fig. 9**. Trillium erectum*[34] |
| *Trillium simile* | 1Trillium cuneatum<br>2.Sweet-scented Trillium. | Southeastern United States (Georgia, Tennessee, Carolina). | Spring flowering plant having sweet-scented white colored flowers. |  <br>***Fig. 10.** Trillium simile*[35] |
| *Trillium smallii* | Melanthiaceae | Sakhalin Island,southeastern United States, particularly in North Carolina, Tennessee, and Georgia. | It grows usually in damp, forested areas, and features oval, dark green leaves with a maroon to purple flower that blooms in early spring. |  <br>***Fig. 11**. Trillium smallii*[36] |
| *Trillium sulcatum* | 1.Southern Red Trillium,<br>2.Barksdale Trillium<br>3.Furrowed wakerobin. | Southern Appalachian Mountains,korea(temperate forested areas.) | Dark reddish blooms are produced by a perennial wildflower plant with pedicellate leaves |  <br>***Fig. 12.** Trillium sulcatum*[37] |
| *Trillium tschonoskii* | ------ | China, Korea. Taiwan and Japan . | White flowers and rhomboid-oval, acuminate leaves are features of this perennial rhizomatous plant, which bears green or purple berries as fruit |  <br>***Fig. 13.** Trillium tschonoskii*[38] |

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|---|---|---|---|---|
| *Trillium undulatum* | 1.Trillium erythrocarpum,<br>2.Trillium pictum<br>3.T.cleavelandicum.<br>4.Painted Lady<br>5.Trille ondule. | Northern Georgia, Northeastern United States, Southern Canada | blooms of the plant are white. |  <br>***Fig. 14**. Trillium undulatum*[39] |
| *Trillium viride* | ------ | North Carolina, Tennessee, and Georgia | This perennial plant has green or occasionally purple blooms . |  <br>***Fig. 15.** Trillium viride*[40] |
| *Trillium vaseyi* | 1.Sweet wakerobin<br>2.Sweet Beth. | United States . | Red-flowered perennial<br><br>Plant that blooms in the spring |  <br>***Fig. 16**. Trillium vaseyi*[41] |
| *Trillium ludovicianum* | 1.Louisiana wakerobin<br>2.Louisiana Trillium. | South Central United States | Perennial herb with dark green, purple, or red blooms. |  <br>***Fig. 17.** Trillium ludovicianum*[42] |

## 5. CONSERVATION OF TRILLIUM GOVANIANUM

The conservation of Trillium govanianum, commonly known as Govan's trillium or Stinking Benjamin, is an important issue due to its limited distribution, slow growth, and specific habitat requirements. While it is not classified as critically endangered, there are several factors that threaten its survival, making conservation efforts crucial.

**Table 7** Conservation Concerns

| | | |
|---|---|---|
| 1. | Habitat Loss | Trillium govanianum grows in wooded areas, particularly in rich, moist, and shaded forests. Urbanization, logging, and agriculture often lead to deforestation and fragmentation of its natural habitat, which threatens its populations. |
| | | The destruction of these habitats limits the availability of the ideal environments that Govan's trillium needs to thrive, reducing its overall distribution |
| 2. | Overharvesting | The plant is popular among wildflower enthusiasts and collectors due to its striking appearance and rarity. Overharvesting, especially from the wild, has led to the depletion of local populations. |
| | | Since Trillium govanianum is slow to mature and can take several years to produce seeds and regenerate, harvesting plants from the wild can significantly impact the population. |
| 3. | Climate Change | Changes in temperature and precipitation patterns due to climate change may affect the habitat conditions necessary for Govan's trillium. Shifts in the timing of seasonal changes (e.g., earlier spring warming) may also disrupt the plant's growth and flowering cycles. |
| 4. | Invasive Species | Invasive plant species can outcompete native species, including Trillium govanianum, for resources such as nutrients, water, and light. These invasions are often caused by human activities and can hinder the plant's growth and survival. |

**Table 8**Conservation Efforts

| | | |
|---|---|---|
| 1. | Habitat Protection | Protecting existing populations of Trillium govanianum involves safeguarding its natural habitats. This can be achieved by designating protected areas, such as nature reserves or conservation easements, where logging, development, and other destructive activities are restricted.<br><br>Restoration of degraded habitats can also help create suitable conditions for the plant to grow and reproduce. |
| 2. | Sustainable Collection Practices | To prevent overharvesting, sustainable collecting practices should be encouraged. This may include regulations on the collection of wild plants, ensuring that harvesting is done in a way that allows populations to regenerate.<br><br>Educating the public and plant collectors about the importance of protecting wild species can also reduce the pressure on natural populations. |
| 3. | Research and Monitoring | Ongoing research into the plant's biology, ecology, and reproductive habits can inform conservation strategies. Monitoring of wild populations helps track changes in numbers and distribution, enabling early intervention if a population begins to decline. |
| 4. | Public Education and Awareness | Raising awareness about the conservation needs of Trillium govanianum is crucial. Educating the public on the importance of native plants and the threats they face can lead to more support for conservation efforts, including the creation of conservation programs and legal protections. |

## 6. MEDICINAL APPLICATIONS

**Table 9** Part used ,Medicinal Applications and Pharmacological Activity.

| Sr.no | Part Used | Medicinal Application | Pharmacological Activity |
|---|---|---|---|
| 1. | Rhizome | Wound healing, antiseptic | Anti-inflammatory, antimicrobial |
| 2. | Rhizome | Fever, respiratory issues | Antipyretic, expectorant |
| 3. | Rhizome | Digestive issues | Anti-diarrheal, anti-ulcer |
| 4. | Rhizome | Skin conditions | Anti-inflammatory, antimicrobial |
| 5. | Leaves | Antioxidant, anti-inflammatory | Antioxidant, anti-inflammatory |
| 6. | Flowers | Antimicrobial, antifungal | Antimicrobial, antifungal |
| 7. | Whole plant | Cancer research, neuroprotective effects | Anticancer, neuroprotective |

**Table 10** Medicinal Use, Plant Part used , Traditional Application , Potential Benefits and Caution and Side Effects.

| Sr.no | Medicinal Use | Plant Part Used | Traditional Application | Potential Benefits | Caution and Side Effects |
|---|---|---|---|---|---|
| 1. | Menstrual Health | Root | Used as an emmenagogue to regulate menstrual flow and relieve irregularities | a)Helps normalize menstrual cycles.<br>b)Reduce menstrual cramps. | Overuse May stimulate strong uterine contractions; avoid during pregnancy . |
| 2. | Astringent | Root | Used for controlling bleeding, treating minor wounds, or diarrhea. | Helps reduce bleeding and tighten tissues, useful for minor cuts. | Overuse can lead to toxicity, (especially internally) |
| 3. | Reproductive Health | Root | Used as a uterine tonic to strengthen the uterus, | Supports uterine health and helps in postnatal recovery. | Can induce labor if taken improperly, leading to |

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| | | | especially postpartum. | | premature contractions |
| 4. | Anti-inflammatory | Root | Used for treating inflammatory conditions like arthritis | May reduces swelling, pain, and inflammation in joints or tissues | \| Excessive use may cause gastrointestinal upset or toxicity. |
| 5. | Digestive health | Root | Treats mild constipation, Nausea ,or digestive disturbances | Mild laxative properties ,aids digestion . | May cause digestive upset or irritation in large quantities. |
| 6. | Respiratory Health | Root | Traditionally used to relieve symptoms of colds and coughs | May help alleviate mild respiratory discomfort like coughs or congestion. | Not extensively studied; use cautiously and consult a doctor |

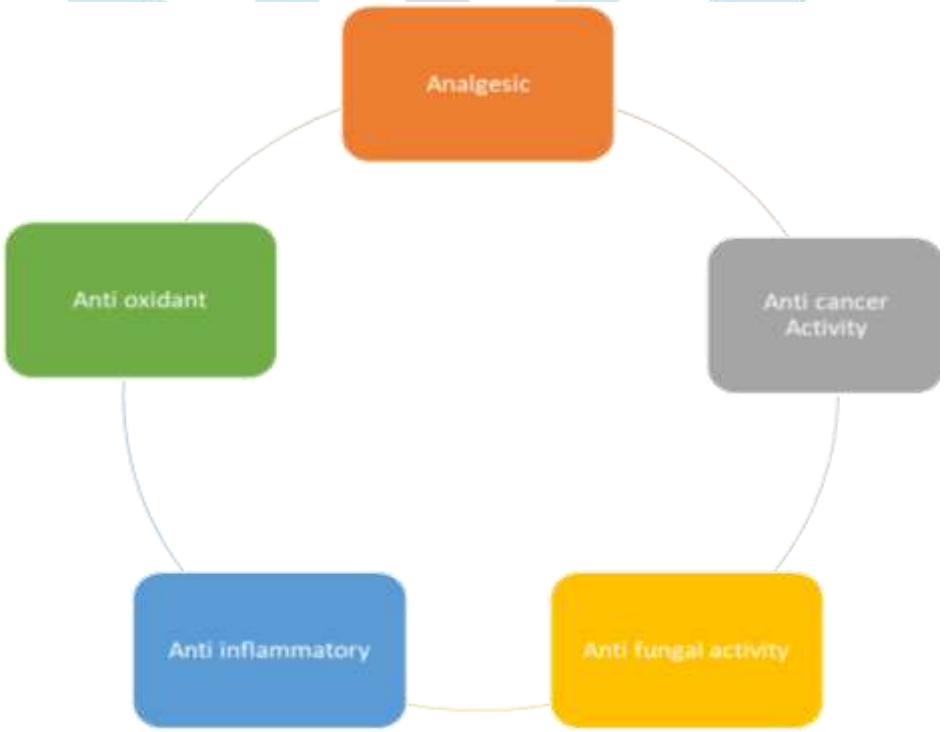


Fig.18. Therapeutic uses

## 7. CONCLUSION

*Trillium govanianum* stands as a valuable plant with significant medicinal properties, particularly in treating ailments such as inflammation, cancer, and infections. However, the growing threat of overharvesting and habitat destruction has placed this species at risk of extinction, highlighting the need for immediate conservation efforts. The loss of this plant would not only diminish its potential contributions to medicine but also disrupt the ecosystems where it thrives. To address this issue, it is essential to adopt sustainable harvesting practices that minimize the impact on wild populations. This includes regulating the collection of the plant, ensuring that it is harvested in a way that does not deplete natural resources. Additionally, establishing protected areas and promoting the cultivation of Trillium govanianum in controlled environments could provide a viable alternative, reducing the pressure on wild habitats.

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