



COMPREHENSIVE REVIEW OF TINOSPORA CORDIFOLIA (GUDUCHI): BOTANICAL, PHARMACOLOGICAL, AND THERAPEUTIC INSIGHTS

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ABSTRACT

Guduchi (*Tinospora cordifolia*) is a highly esteemed herb in Ayurvedic medicine, recognized for its wide-ranging therapeutic effects. This review compiles and analyzes current scientific and clinical insights into *Guduchi*, emphasizing its pharmacological attributes, therapeutic applications, and safety considerations. Commonly referred to as *Giloy*, *Guduchi* is known for its immunomodulatory, anti-inflammatory, antipyretic, and antioxidant activities, which support its use in treating conditions such as metabolic syndromes, respiratory ailments, and autoimmune disorders. The review integrates data from recent research, detailing its bioactive constituents, underlying mechanisms, and clinical effectiveness. It also explores potential adverse effects and drug interactions, offering a holistic perspective on *Guduchi's* relevance in modern healthcare. The evidence highlights *Guduchi's* potential as a valuable therapeutic agent, while advocating

for more robust studies to clarify its clinical utility and safety.

INTRODUCTION

Tinospora cordifolia, commonly known as *Guduchi* and revered in Ayurveda as "*Giloy*" or "*Amrita*"—terms symbolizing "nectar of life" or "immortality"—is a distinguished medicinal

plant recognized for its broad spectrum of therapeutic benefits. Traditionally employed in Indian medicine to support holistic health and vitality, this perennial climbing shrub from the Menispermaceae family thrives in tropical climates across India, Southeast Asia, and parts of South America. The stem, which serves as the principal component in medicinal formulations, is notable for its heart-shaped foliage and yellow-green, tuberous fruits.

Guduchi is acclaimed for its multifaceted pharmacological actions, including immunomodulatory, antipyretic, anti-inflammatory, and antioxidant effects. Its capacity to enhance immune function, counter infections, and facilitate detoxification underscores its versatility in treating ailments such as fever, persistent infections, metabolic disorders like diabetes, and gastrointestinal disturbances. Traditionally valued for promoting longevity and resilience, *Guduchi* has garnered increasing attention in modern research aimed at substantiating its therapeutic claims.

Scientific investigations have identified key bioactive constituents—such as alkaloids, glycosides, and terpenoids—that contribute to its medicinal efficacy. These compounds have demonstrated potential in modulating immune pathways, mitigating oxidative damage, and reducing inflammation, thereby reinforcing its traditional applications and suggesting its relevance in modern integrative medicine. Nonetheless, further rigorous studies are essential to fully delineate *Guduchi*'s clinical effectiveness, safety parameters, and optimal usage. This overview encapsulates *Guduchi*'s historical importance, emerging scientific validation, and current understanding of its therapeutic promise.

Scientific Nomenclature

Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson; also known by related species names such as *Tinospora malabarica* Miers ex Hook and *Tinospora crispa* Miers.^[1]

- **Botanical Family:** Menispermaceae
- **Ayurvedic Classification (Kula):** *Guduchi Kula*
- **Vernacular names**

Language	Name
English	Indian tinospora
Hindi	Giloe
Marathi	Ambarvel, Gulavela
Gujarati	Gado, Gulo
Assame	Amarlata
Telugu	Tippa teega
Tamil	Amrida valli

Kashmiri	Amrita, Gilo.
Udru	Gilo, Gilokhushk, gilo-i-sabz, satgilo

Historical review

According to ancient lore, during the epic battle between Lord Rama and Ravana, numerous monkey warriors allied with Lord Rama lost their lives. In celebration of Ravana's defeat, Lord Indra showered a divine elixir upon the fallen warriors, reviving them. It is believed that wherever drops of this celestial nectar touched the earth, *Guduchi* plants emerged, symbolizing rejuvenation and immortality.

Vedic References

During the Vedic period, *Guduchi* held protective and medicinal value. Sayana, in his commentary on the *Saunakiya Atharvaveda*, noted that *Guduchi* was commonly kept in households to repel venomous creatures like snakes and scorpions. In the *Kaushika Sutra*, the herb is mentioned under the name '*Kudruchi*', reflecting its early recognition and utility in Vedic rituals and domestic life.

Samhita Period References

- ***Charaka Samhita*^[2]**: *Guduchi* is extensively referenced with multiple synonyms and is classified under seven distinct *Dashemani* therapeutic categories. It is particularly noted for its *Sangrahika* (astringent and consolidating) and *Vibandhaprahamana* (relieving constipation) properties, highlighting its role in gastrointestinal and systemic health.
- ***Sushruta Samhita*^[3]**: This classical text mentions *Guduchi* in 41 different contexts, placing it within nine therapeutic groups (*Ganas*) that reflect its wide-ranging medicinal applications. It is also included in more specialized formulations such as *Vallipanchamoola*, emphasizing its utility in compound herbal preparations.
- ***Ashtanga Samgraha*^[4]**: *Guduchi* is cited both individually and in combination with other herbs for the treatment of ailments like *Jwara* (fever) and *Prameha* (metabolic disorders, including diabetes), underscoring its relevance in managing acute and chronic conditions.

Nighantu Period References

- ***Dhanvantari Nighantu*^[5]**: *Guduchi* is among the earliest herbs documented in one of the seven *Vargas* (classifications). It describes two distinct types—*Guduchi* and *Kanda Guduchi*—highlighting varietal differentiation.

- **Kaiyadeva Nighantu**^[6]: Listed under the *Aushadha Varga*, Guduchi is categorized into two forms: *Guduchi* and *Pinda Guduchi*, reflecting its medicinal diversity.
- **Bhavprakasha Nighantu**^[7]: Included in the *Guduchyadi Varga*, this text emphasizes Guduchi's mythological origins and its therapeutic roles as a *Rasayana* (rejuvenative), *Deepana* (digestive stimulant), and *Balya* (strength enhancer).
- **Raj Nighantu**^[8]: Provides detailed descriptions of two types—*Guduchi* and *Kanda Guduchi*—along with their respective medicinal applications.
- **Shaligrama Nighantu**^[9]: Mentions *Guduchi* within the *Guduchyadi Gana*, reinforcing its place in classical herbal groupings.

classification according to various authors

- *Charaka Samhita* - *Triptighna*, *Stanyasodhana*, *Dahaprashamana*, *Snehapoga*, *Trsnanigrahana*, *Sandhaniya*, *Vayasthapana Mahakashaya*
- *Sustruta Samhita* - *Guduchyadi*, *Patoladi*, *Aragwadahadi*, *Kakolyadi*, *Vallipanchamula*
- *Ashtanga Hridaya* - *Shaka Varga*, *Padmakadi Gana*, *Patoladi Gana*, *Guduchyadi Gana*, *Aragvadhadi Gana*, *Shyamadi Gana*
- *Bhavprakasha Nighnatu* – *Guduchyadi Varga*
- *Dhanvantari Nighantu* – *Guduchyadi Varga*
- *Raj Nighantu* – *Guduchyadi Varga*
- *Shaligrama Nighantu*– *Guduchyadi Varga*
- *Nighantu Adarsha*– *Guduchyadi Varga*
- *Shodala Nighantu* – *Guduchyadi Varga*
- *Madanapal Nighantu* - *Abhayadi Varga*
- *Kaiyadeva Nighantu* - *Aushadiya Varga*
- *Priya Nighantu* - *Pippalyadi Varga*

Rasapanchaka

Text	Rasa	Guna	Virya	Vipaka
<i>Charaka-Samhita</i>	<i>Tikta</i>	<i>Guru</i>	<i>Ushna</i>	<i>Madhura</i>
<i>Sushruta Samhita</i>	<i>Tikta</i>	<i>Guru</i>	-	<i>Guru</i>
<i>Astanga Sangraha</i>	<i>Tikta</i>	-	<i>Ushna</i>	-
<i>Astanga Hridaya</i>	<i>Tikta</i>	-	<i>Shita</i>	<i>Katu</i>
<i>Dhanwantari Nighantu</i>	<i>Tikta, Kashaya</i>	<i>Guru</i>	<i>Ushna</i>	-
<i>Madanpal Nighantu</i>	<i>Tikta, Kashaya, Katu</i>	<i>Laghu</i>	<i>Ushna</i>	<i>Madhura</i>
<i>Kaiyadeva Nighnatu</i>	<i>Tikta, Kashaya, Katu</i>	<i>Laghu</i>	<i>Ushna</i>	<i>Madhura</i>
<i>Raja Nighantu</i>	<i>Tikta, Kashaya</i>	<i>Guru</i>	<i>Ushna</i>	-

Bhavprakash Nighantu	Tikta, Kashaya, Katu	Laghu	Ushna	Madhura
Shaligram Nighnatu	Tikta, Kashaya	Guru, Ushna	Ushna	Madhura

Reference of Guduchi from Charaka Samhita

Sr. No.	Reference	Formulation/ Preparations	Rogaadhikar/ Indication
1.	Ch.Su.2/12	Niruha vasti	Udavarta
2.	Ch.Su.3/2	Churna-Pradeha	Kushta, Kilas
3.	Ch.Su.3/9	Kusthadi churna	Kushta, Kilas
4.	Ch.Su.3/21	Vedsaniak Lepa	Vatarakta
5.	Ch.Su.4/11	Triptighana Mahakashya	-
6.	Ch.Su.4/18	Stanyajanana Mahakashya	-
7.	Ch.Su.4/29	Trisnani-graha Mahakashya	-
8.	Ch.Su.4/41	Dahaprasaman Mahakashya	-
9.	Ch.Su.4/50	Vayahsthapana Mahakashya	-
10.	Ch.Su.14/30	Nadisweda dravaya	Swedana
11.	Ch.Su.21/22	Guduchi kashaya	Medoroga
12.	Ch.Su.25/40	Amrita	-
13.	Ch.Vi.8/143	Tikta Sakanda	-
14.	Ch.Chi.3/198	Jwaranasak kashaya	Jwara
15.	Ch.Chi.3/211	Satayaadi kwatha	Jwara
16.	Ch.Chi.3/222	Vasadi ghrita	Jirna Jwara
17.	Ch.Chi.3/267	Agaruadi taila	Sheeta prasamana, Jwara
18.	Ch.Chi.3/298	Shatapala ghrita	Visama Jwara
19.	Ch.Chi.7/123	VK- kushthaghana yoga	Kushta
20.	Ch.Chi.7/153	Mahakhadira ghrita	Kushta
21.	Ch.Chi.8/72	Parisheka sweda	Rajayakshma
22.	Ch.Chi.12/25	VP-Sotha	Sotha
23.	Ch.Chi.12/34	Punarnawaadayarishya	Sotha
24.	Ch.Chi.15/190	Panchama kshara	Gharani
25.	Ch.Chi.16/63	Prataha kalin yoga	Pandu
26.	Ch.Chi.16/134	Guduchi swarasa	Halimaka
27.	Ch.Chi.17/93	Nidigadhadi yoga	Hikka, Swasa
28.	Ch.Chi.17/102	Dashmuladi yoga	Hikka, Swasa
29.	Ch.Chi.18/35	Kantakari ghrita	Kasa
30.	Ch.Chi.18/160	Guduchyadi ghrita	Kasa
31.	Ch.Chi.21/58	Mustadi kwatha	Visarpa
32.	Ch.Chi.21/130	Ghranti visarpa	-
33.	Ch.Chi.1-1/58	Bhramaharasayana	Rasayana
34.	Ch.Chi.1-1/63	Chayavanaprash	Rasayana
35.	Ch.Chi.3/202	Vishamajwara nashak kwatha	Vishama jwara
36.	Ch.Chi.3/247	Guduchyadi niruahavasti	Jwara
37.	Ch.Chi.7/145	Mahatikta ghrita	Kushta
38.	Ch.Chi.23/70	Gandahastinamaka agadha	Visha
39.	Ch.Chi.26/242	Amritadi varti	Netra vyadhi
40.	Ch.Chi.28/148	Bala taila	Vatavyadhi
41.	Ch.Chi.28/157	Amritadhya taila	Vatavyadhi
42.	Ch.Chi.28/170	Vrishamuladi taila	Vatavyadhi
43.	Ch.Chi.29/71	Drakshadi kshir	Vatashonita

44.	Ch.Chi.29/92	Madhuparnyadi tail	Vatashonita
45.	Ch.Chi.29/103	Amritaadya taila	Vatashonita
46.	Ch.Chi.29/117	Satapaka madhuparni taila	Vatashonita
47.	Ch.Chi.29/121	Guduchyadi tail	Vatashonita
48.	Ch.Chi.28/172	Mulaka taila	Vatavyadhi

Reference of Guduchi from Sushruta Samhita

S. No.	Reference	Formulation/ Preparations	Rogaadhikar/ Indication
1.	Su.Su.12/26	Atidagdha	Aganikarama
2.	Su.Su.25/21	Sivana Karma	Asthavidhshastra karma
3.	Su.Su.38/6	Aaraghwadhadi gana	Varana sodhana
4.	Su.Su.38/29	Shyamadi gana	Udavarta
5.	Su.Su.38/33	Patoladi gana	Jwara prasamana
6.	Su.Su.38/51	Guduchyadi gana	Sarvajwara
7.	Su.Su.38/73	Vallipanchmula	Sarvameha
8.	Su.Su.44/5	Kapha vyadahi	Virechana
9.	Su.Chi.5/8	Guduchi kwath	Pitta jwara
10.	Su.Chi.6/13	Guduchitakra kalpa	Arsa
11.	Su.Chi.10/4	Guduchi kashaya	Mahakushta
12.	Su.Chi.10/14	Guduchi swarasa	Sarvakushta
13.	Su.Chi.11/9	Guduchi kashaya	Sharpimeha
14.	Su.Chi.15/44	Guduchadi taila	Mudhagarbha
15.	Su.Chi.20/50	Guduchadi lepa	Valamik
16.	Su.Chi.27/7	Guduchi kashaya	Rasayana
17.	Su.Chi.37/34	Tripaladi taila	Anuvasana vasti
18.	Su.Chi.38/43	Sampakadi kwatha	Niruha vasti
19.	Su.Chi.38/47	Guduchi kashaya	Niruha vasti
20.	Su.U.19/13	Guduchi kashaya	Kukunaka
21.	Su.U.39/152	Guduchi shaka	Jwara
22.	Su.U.39/170	Guduchi kashaya	Vattaj jwara
23.	Su.U.39/173	Darakshadi kwatha	Vattaj jwara
24.	Su.U.39/174	Guduchi swarasa	Vattaj jwara
25.	Su.U.39/178	Guduchi kashaya	Pittaj jwara
26.	Su.U.39/212	Triphaladi yoga	Vishmaawara
27.	Su.U.39/223	Guduchayadi ghrita	Jirana jwara
28.	Su.U.39/227	Patoladi ghrita	Jwara
29.	Su.U.40/50	Patoladi churana	Amaatisara
30.	Su.U.40/63	Pittapachaka kwatha	Pittaatisara
31.	Su.U.44/40	Guduchayadi ghrita	Lagharaka
32.	Su.U.49/27	Guduchi kashaya	Sannipataja chardi

Reference of Guduchi from Astang Hridaya

S.No.	Reference	Formulation/Preparations	Rogaadhikara/Indication
1	Ash.H.Su.10/29	Tiktasakandha	—
2	Ash.H.Su.14/22	Triphaladi Churna	Apatarpana
3	Ash.H.Su.15/7	Aaraghavaadi Gana	Kushta
4	Ash.H.Su.15/15	Patoladi Gana	Kushta

5	Ash.H.Su.15/16	Guduchyadi Gana	Kapha-Pitta Roga
6	Ash.H.Sa.2/7	Nagaradi Kwatha	Rakatasarava
7	Ash.H.Chi.1/46	Mustadi Kwatha	Jwara
8	Ash.H.Chi.1/52	Kiraitkadi Kwatha	Vishamajwara
9	Ash.H.Chi.1/66	Nagaradi Kwatha	Jwara
10	Ash.H.Chi.1/94	Guduchi Swarasa	Jirana Jwara
11	Ash.H.Chi.3/3	Guduchyadi Ghrita	Kasa
12	Ash.H.Chi.3/164	Vasadi Ghrita	Kasa
13	Ash.H.Chi.6/14	Drakshadi Swarasa	Chardi
14	Ash.H.Chi.7/25	Guduchyadi Swarasa	Madatayaa
15	Ash.H.Chi.11/12	Dvadi Kwatha	Mutraghata (urinary obstruction)
16	Ash.H.Chi.12/6	Guduchi Swarasa	Prameha (diabetes/urinary disorders)
17	Ash.H.Chi.16/13	Vasadi Kwatha	Pandu (anemia)
18	Ash.H.Chi.16/43	Guduchi Swarasa	Halimaka (type of anemia/jaundice)
19	Ash.H.Chi.18/6	Duralabhadi Kwatha	Visarpa (erysipelas)
20	Ash.H.Chi.18/30	Devadarwadi Kwatha	Ghranthi Visarpa (nodular erysipelas)
21	Ash.H.Chi.19/39	Nisadi Kwatha	Kushta (skin diseases)
22	Ash.H.Chi.19/86	Guduchyadi Lepa	Kushta
23	Ash.H.Chi.22/7	Guduchi Swarasa	Vattashonita (vata-rakta)
24	Ash.H.Chi.22/15	Guduchi Kwatha	Vattashonita
25	Ash.H.Ka.4/1	Baladi Kwatha	Basti (urinary disorders or enema therapy)
26	Ash.H.Ka.4/55	Dashmuladi Kwatha	Anuvasana Basti (enema therapy)
27	Ash. H. Utt.9/27	Patoladi Kwatha	Vartama Roga (eye disorders)
28	Ash. H. Utt.22/6	Guduchyadi Ghrita	Mukha Roga (oral diseases)
29	Ash. H. Utt. 22/68	Guduchyadi Kwatha	Galaganda (goiter)
30	Ash. H. Utt.22/78	Guduchyadi Kwatha	Mukha Arbuda (oral tumors)
31	Ash. H. Utt.22/97	Chudradi Kwatha	Mukha Roga
32	Ash. H. Utt.34/28	Kashamaryadi Ghrita	Vataja Yonivyapada (gynecological disorder)
33	Ash. H. Utt.34/33	Guduchyadi Kwatha	Yoniprakshalana (vaginal wash)
34	Ash. H. Utt.38/20	Nishothadi Lepa	Visha (poisoning)
35	Ash. H. Utt.39/44	Guduchi Swarasa	Medhya Rasayana (nootropic/rejuvenation)

Karma

Karma	CS	SS	AS	DN	KN	RN	BPN	Sha.N
Vatahara	+	+	+	-	-	+	-	+
Amahara	-	-	-	-	-	-	-	+
Sangrahi	+	-	-	+	+	-	+	+
Hridya	-	-	-	-	+	-	-	+
Balya	+	+	+	+	+	-	+	+
Vanhnikrita	-	-	-	-	+	-	-	-
Vatapittahara	+	+	+	-	-	-	-	-

Ayushya	-	-	-	+	-	-	-	+
Medya	-	-	-	+	-	-	-	-
Medohara	-	+	+	+	-	-	-	+
Pittahara	+	+	+	+	-	-	-	-
Vataraktahara		-	-	+	+	-	+	+
Dipaneeya	+	+	+	-	-	-	+	+
Rasayani	+	+	+	-	+	-	-	+
Tridoshahara	-	+	+	+	-	-	+	+
Vayasthapaniya	+	-	-	-	-	-	-	-
Raktadoshahara	-	+	+	-	-	+	-	+

Rogaghnata

Rogaghnata	CS	SS	AS	DN	KN	RN	BPN	Sh.N
Kamalahara	-	-	-	+	-	-	+	+
Pramehara	-	+	+	-	+	+	+	+
Kandugahna	-	+	+	+	-	-	-	+
Trishnanigraha	+	-	-	-	+	-	-	+
Visarpaghna	-	-	-	+	+	-	-	+
Kasahara	-	-	-	-	-	-	+	+
Dahaprashamanam	+	+	-	-	-	+	+	+
Kushtahara	-	+	-	+	-	-	+	+
Krimighna	-	-	-	+	-	-	+	+
Rakatarshaghna	-	-	-	+	-	-	-	+
Bhramahara	-	-	-	-	-	+	-	+
Chardighna	-	+	-	-	-	+	+	+
Panduhara	-	-	-	+	-	+	+	+
Jwarahara	+	+	-	+	-	+	+	+

Pharmacognostic Profile of *Guduchi* (*Tinospora cordifolia*)

Macroscopic Characteristics^[10]

Guduchi, a widely revered herb in Ayurvedic medicine, presents distinct morphological features that aid in its identification and quality assessment. The crude drug is typically found in stem segments ranging from 0.6 to 5 cm in diameter.

- Young stems exhibit a smooth, green surface with noticeable swellings at the nodes, indicative of active growth.
- Mature stems transition to a light brown hue and develop characteristic warty protuberances due to the presence of circular lenticels.
- On transverse sectioning, the stem reveals a well-defined radial structure, with prominent medullary rays traversing a porous matrix.
- The taste of *Guduchi* is distinctly bitter, aligning with its traditional classification as a *Tikta rasa* herb in Ayurveda.

Microscopic Characteristics

A detailed microscopic examination of *Guduchi's* stem reveals a complex and well-organized internal structure, reflecting its diverse pharmacological properties.

- **Cork Layer:** The outermost layer comprises two zones:
 - An external zone of thick-walled, brown, compressed cells.
 - An internal zone of thin-walled, colorless cells arranged tangentially.The cork is often disrupted by lenticels, which facilitate gaseous exchange.
- **Secondary Cortex:** This region consists of five or more layers of cells, with the outermost cells being smaller than the inner ones. Notable features include:
 - Clusters of sclereids (2–10 cells) located near lenticels.
 - An outer zone of 3–5 rows of irregularly arranged, tangentially elongated chlorenchymatous cells.
 - Inner cortical cells are polygonal and densely packed with starch grains.
 - Scattered secretory cells contribute to the herb's bioactivity.
- **Pericycle**

Contains lignified fibers with wide lumens and pointed ends, often associated with crystal fibers housing single calcium oxalate prisms.
- **Vascular Region:** Characterized by
 - 10–12 or more wedge-shaped xylem segments, each bordered by semi-circular phloem bands.
 - Broad medullary rays alternating between xylem and phloem.
 - Phloem tissue composed of sieve tubes, companion cells, and parenchyma embedded with calcium oxalate crystals.
- **Cambium**

Located between xylem and phloem, consisting of 1–2 layers of tangentially elongated cells per vascular bundle.
- **Xylem Composition:** Includes vessels, tracheids, parenchyma, and fibers.
 - Primary xylem vessels are narrow.
 - Secondary xylem vessels are thick-walled and lignified, contributing to structural integrity.

- **Medullary Rays and Pith:** Medullary rays contain starch grains of various shapes, while the central pith is composed of large, thin-walled cells, predominantly filled with starch grains.

Morphological Overview of the Menispermaceae Family^[11]

The Menispermaceae family, to which *Tinospora cordifolia* (Guduchi) belongs, is distinguished by several unique morphological traits, most notably its crescent- or moon-shaped seeds—a defining feature that reflects the etymology of the family name.

General Habit

Members of this family are predominantly tropical, comprising woody climbers, herbs, or trees, often perennial or deciduous in nature. The plants typically exhibit simple to uniserrate trichomes (hairs), contributing to their adaptive resilience in varied climates.

Stem Characteristics

Stems are known for their vigorous growth and are anatomically marked by trilacunar nodes, which facilitate efficient vascular connectivity and support rapid elongation.

Leaf Morphology

Leaves are alternate in arrangement and generally palminerved, with margins that may be entire or lobed. They are exstipulate, meaning they lack stipules, and often display a broad, functional surface area conducive to photosynthesis.

Inflorescence Structure

Inflorescences are typically dioecious, with male and female flowers borne on separate plants. They are small to minute in size and may appear in fascicles, panicles, or racemes, though solitary flowers are occasionally observed. The sepals, usually numbering six, are arranged in 2–4 imbricate series, providing protective layering during bud development.

Floral Morphology

- **Male Flowers:** Stamens are hypogynous, positioned beneath the ovary, and are equal in number to the petals, typically opposite them. Filaments may be free or fused, while anthers are generally adnate, with extrorsely or lateral dehiscence, facilitating effective pollen dispersal.
- **Female Flowers:** These may contain six staminodes or none at all. The ovary is usually composed of three carpels, each bearing a solitary ovule, most often amphidromous in

orientation. The style tends to be recurved, either simple or lobed, and the mature carpels develop into drupes, with the style-scar located sub-terminally or sub-basally.

Seed Characteristics

Seeds are typically hooked or kidney-shaped (reniform) and often curve around an endocarp intrusion, a trait that aids in dispersal and protection. The albumen may be uniform, ruminant, or absent, and cotyledons vary in form—being flat, semi terete, or fleshy, and either appressed or spreading, depending on the species.

Botanical Description^[12]

Tinospora cordifolia, commonly known as *Guduchi* or *Giloy*, is a large, glabrous, deciduous climbing shrub widely distributed across tropical regions of India, thriving up to elevations of 300 meters. The plant is characterized by succulent stems and long, fleshy aerial roots. Its bark varies from grey-brown to creamy white and is marked by warty outgrowths. The leaves are membranous, heart-shaped (cordate), and possess a broad basal sinus.

Flowers are small, yellow to greenish-yellow, and typically emerge when the plant is leafless. They are borne in axillary and terminal racemes or racemose panicles. Male flowers appear in clusters, while female flowers are usually solitary. The fruits are ovoid, glossy, red, and pea-sized, containing curved seeds. *Guduchi* is occasionally cultivated for ornamental purposes and propagated through stem cuttings. Its leaves are protein-rich and serve as nutritious fodder for cattle.

Traditional and Ayurvedic Applications^[13]

Guduchi holds a prominent place in Ayurvedic literature, traditionally prescribed for conditions such as general debility, dyspepsia, fevers, and urinary disorders. The dried stems, used medicinally with bark intact, must meet pharmacopeial standards, containing no more than 2% foreign organic matter.

Phytochemical Composition and Pharmacological Properties^[14]

The stem of *T. cordifolia* contains a diverse array of bioactive compounds, including:

- Alkaloids (e.g., berberine)
- Glucosides
- Bitter principles such as columbin, chasmanthin, and palmarin
- Crystalline substances

- Neutral fatty alcohols
- Essential oils
- Unique compounds like tinosporon, tinosporic acid, and tinosporol

These constituents contribute to its wide-ranging pharmacological actions, including:

- Antiperiodic
- Antispasmodic
- Anti-inflammatory
- Antipyretic
- Analgesic (approximately one-fifth the potency of sodium salicylate)
- Antibacterial (notably against *Escherichia coli*)
- Immunomodulatory (high phagocytic index; inhibition of *Mycobacterium tuberculosis* in vitro)

Experimental and Clinical Evidence^[15]

Studies have demonstrated *Guduchi's* influence on carbohydrate metabolism and insulin regulation, with significant effects on fasting blood glucose, glucose tolerance, and epinephrine-induced hyperglycemia in animal models. Its extracts have shown hepatoprotective effects in goats with carbon tetrachloride-induced liver damage and in vitro activity against Hepatitis B and E surface antigens.

Guduchi's immunomodulatory potential is well-documented:

- Enhances leukocyte count and neutrophil activity
- Stimulates macrophage function and phagocytosis of *Staphylococcus aureus*
- Protects against sepsis-induced mortality in animal models
- Reduces mortality in *E. coli*-induced peritonitis
- Improves resistance in cholestatic patients without direct antibacterial action

Clinical trials have also reported cognitive improvements in children with behavioural and mental deficits, suggesting neuroprotective and adaptogenic effects mediated via the Psycho-Neuro-Endocrine-Immune (PNI) axis.

Therapeutic Uses and Formulations

Guduchi is utilized in various forms across traditional and modern medicine:

- **Aqueous stem extract:** Used as a general tonic for debility

- **Leaf decoction:** Treats gout; bruised young leaves in milk serve as a liniment for erysipelas
- **Leaves with honey:** Applied to ulcers
- **Powdered fruit with ghee or honey:** Used for jaundice and rheumatism
- **Root:** Acts as a potent emetic; used for visceral obstructions and leprosy
- **Stem extract:** Beneficial for skin disorders, fevers, and urinary conditions
- **Combined formulations:** Serve as antidotes for snake bites and scorpion stings

Pharmacodynamic Profile^[16]

The stem is described as bitter, astringent, sweet, thermogenic, and anodyne. It exhibits a broad spectrum of actions

- Anthelmintic
- Alterative
- Digestive
- Carminative
- Appetizer
- Stomachic
- Constipating
- Cardiotonic
- Depurative
- Hematinic
- Expectorant
- Aphrodisiac
- Rejuvenate
- Galactagogue
- Tonic

Indications

Guduchi is traditionally and clinically indicated for:

- Fever (intermittent and chronic)
- Dyspepsia and acid gastritis
- Jaundice and anemia
- Rheumatism and gout
- Skin diseases, leprosy, and erysipelas

- Urinary disorders and splenomegaly
- Respiratory conditions (cough, asthma)
- Cardiac debility and general weakness
- Menometrorrhagia and haemorrhoids
- Helminthiasis and filariasis
- Eye diseases and seminal weakness

The whole plant, when ground, is applied to fractures. Starch derived from its roots and stems is effective in treating acid diarrhoea and dyspepsia. Fresh juice acts as a diuretic, and the leaves are particularly beneficial in managing jaundice.

Geographical Distribution

Tinospora cordifolia is predominantly found across the Indian subcontinent, with its natural range extending to India, Sri Lanka, and Bangladesh. Within India, the species is widely distributed throughout tropical regions, including Arunachal Pradesh, the southern states, and areas from Kumaon eastward and southward toward Sri Lanka, thriving at elevations up to 900 meters. The plant is also frequently cultivated, both for medicinal use and ornamental purposes.

Phytochemical Profile of *Tinospora cordifolia*

Tinospora cordifolia is rich in a diverse array of bioactive compounds that contribute to its extensive therapeutic potential. The plant's stem, in particular, contains a complex mixture of alkaloids, glycosides, terpenoids, and other secondary metabolites. Key constituents identified include:

- **Alkaloids and Terpenoids:** Tinosporine, Tinosporan, Tinosporic Acid, Tinosporol, Tinosporide, and Tinosporidine are prominent terpenoid derivatives. The plant also contains Columbin, Chasmanthin, and Palmarin, known for their bitter and therapeutic properties.
- **Isoquinoline Alkaloids:** Notable compounds such as Berberine, Giloin, Giloinisin, Magnoflorine, and Tembetarine exhibit antimicrobial, anti-inflammatory, and immunomodulatory effects.
- **Unique Structural Compounds:** Includes 1,2-substituted pyrrolidine, a diterpenoid, Furanolactone, and 18-norclerodane diterpene-O-glycoside, which contribute to the plant's adaptogenic and hepatoprotective actions.

- **Lignans and Sterols:** The presence of phenolic lignans like α ,4-dihydroxy-3-methoxybenzyl-4-(4-hydroxy-3-methoxybenzyl)-tetrahydrofuran, along with β -sitosterol, supports its antioxidant and anti-inflammatory properties.
- **Fatty Alcohols and Hydrocarbons:** Compounds such as Octacosanol, Nonacosan-15-one, and Heptacosanol are associated with metabolic and cardiovascular benefits.
- **Other Notable Constituents:** Includes Cordifolide, Cordifol, Cordifolon, Unosporin, Cardiofoliosides A & B, and Arabinogalactan, each contributing to the herb's pharmacological versatility.

Pharmacological Activities of *Tinospora cordifolia*^[17]

Tinospora cordifolia exhibits a wide spectrum of pharmacological actions, validated through both traditional use and modern scientific research. Its bioactive constituents contribute to the following therapeutic effects

- **Metabolic Regulation:** Demonstrates hypoglycaemic and anti-hyperglycaemic properties, making it effective in managing diabetes and glucose metabolism disorders.
- **Neurological Effects:** Acts as a central nervous system depressant, contributing to its calming and anti-stress effects.
- **Antimicrobial Action:** Possesses antibacterial and antimicrobial activities, useful in combating various infections.
- **Anti-inflammatory and Antipyretic:** Exhibits strong anti-inflammatory, antipyretic, and analgesic effects, beneficial in treating fever, pain, and inflammatory conditions.
- **Autoimmune and Allergic Conditions:** Shows antiarthritic, anti-allergic, and immunosuppressive properties, supporting its use in autoimmune and hypersensitivity disorders.
- **Liver Protection:** Offers hepatoprotective effects, aiding in liver detoxification and regeneration.
- **Immune Modulation:** Functions as both an immunostimulant and immunomodulator, enhancing immune response while regulating overactivity.
- **Oncological Potential:** Displays antineoplastic, anti-tumour, and anti-leishmanial activities, indicating promise in cancer and parasitic disease management.
- **Adaptogenic and Anti-Stress:** Acts as an adaptogen, helping the body resist physical and psychological stress.
- **Antioxidant and Detoxifying:** Provides antioxidant and antiendotoxic effects, protecting against oxidative damage and toxin-induced cellular injury.

- **Cardiovascular and Renal Support:** Exhibits hypotensive and diuretic properties, contributing to blood pressure regulation and fluid balance.

DISCUSSION AND CONCLUSION

Guduchi (*Tinospora cordifolia*) demonstrates notable immunomodulatory properties, exhibiting both immunostimulatory and immunoregulatory effects. Its influence on immune cell activity, modulation of cytokine profiles, and antioxidant potential collectively contribute to enhanced immune resilience and homeostasis. These multifaceted actions make *Guduchi* a promising candidate for managing immune-related disorders and promoting overall immune health. The convergence of classical Ayurvedic insights with contemporary scientific validation reinforces its therapeutic relevance, positioning *Guduchi* as an integrative agent in immune system modulation and disease management.

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