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# *Tinospora cordifolia* cultivation practices and medicinal properties: A review

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**Abstract**
Medicinal plants have been utilized by people for their therapeutic benefits from the beginning of human existence. For thousands of years, the environment has been a source of medical compounds, and a significant proportion of contemporary medications have been identified from natural sources. Giloy's *Tinospora cordifolia* is a popular herbaceous vine in India. *Tinospora cordifolia*, often famous as "Guduchi," is well-known in old Ayurvedic collected works for its extensive use in the treatment of a variety of ailments. The discovery of active modules from plants and their biological function in disease regulators has recently sparked widespread interest in plants. The cultivation procedures, therapeutic properties and phytochemistry of Giloy/Guduchi, as well as the commercial importance of the plants, are exposed in this review.

**Keywords:** phytochemistry, *Tinospora cordifolia*, ayurvedic medicine, cultivation procedures, economic importance

## Introduction
According to the WHO, traditional medicines utilising plant extracts or their active elements are used by 80% of the world's population. With vast biodiversity and evidence of ironic historical traditional medical systems (Ayurveda, Siddha, Unani, Amchi, and local health traditions), India provides a firm foundation for the use of a wide range of plants in all-purpose healthcare and the treatment of common human disorders (Pandey 2008). *Tinospora cordifolia* is a Tinospora species (Thunb.) Miers has long been utilised in Ayurvedic medicine in India. The popular names for this perennial, herbaceous vine from the Menispermaceae family include Giloy, Guduchi, Gurcha, Amrita, and heart-leaved moonseed. The species may be found in the tropical and subtropical zones at a height of 600 metres. India, Bangladesh, Sri Lanka, Myanmar, China, Thailand, the Philippines, Indonesia, Malaysia, Borneo, Vietnam, and North and South Africa are all places where it may be found. Giloy is a large climbing shrub with elongated twining branches that cover the ground. The presence of wiry aerial roots that emerge from the branches is a distinguishing feature. Succulent stems with rosette-like flowers, deep clefts, papery bark, and a creamy white to grey colour (lenticels). The leaves are simple, alternating, cordate-ovate, and very thin, with long, bulging leaf stalks at the base and tip. Racemes are axillary and terminal inflorescences with tiny, unisexual dioecious flowers that are greenish yellow in colour. The fruits are three subglobose drupes with short stalks that ripen to a scarlet colour. The shrub blooms in the summer and produces fruit in the winter. Steroids, aliphatics, alkaloids, glycosides, and diterpenoid lactones are just a few of the active ingredients present in this genetically diverse plant. These powerful compounds are located in the root and stem of the plant. The plant has a long history of being used to cure a range of ailments and disorders in India's traditional medical system and by ayurveda practitioners. Tinospora has grabbed the interest of researchers due to its recently discovered medicinal properties.

## Botanical Description
The tree is a big, a deciduous plant that cultivates to 1 meter (3.3 feet) high and 0.5meters (1.65 feet) wide extensively dispersal climbing shrub with several elongated twisting branches. Giloy Leaves simple, exstipulate, alternate, long petioles up to 15 cm long, pulvinate, roundish, both at the base and apex with the basal one longer and twisted partially and halfway around. Lamina ovate-cordate or broadly ovate, 15-20 cm long and 10-15 cm broad, 7 nerved & deeply cordate at base, pubescent above, membranous, whitish tomatoes with a prominent reticulum beneath. T. cordifolia flowers are having unisexual, having greenish yellow on axillary and terminal racemes and have clustered Male flowers and solitary female. Sepals 6, free in two series of three each, the outer ones are smaller than the inner. Petals 6 free is smaller than sepals, obovate and membranous. Fruits aggregate of 1-3, ovoid smooth drupelets on a thick stalk with subterminal style scars, scarlet or orange coloured.

## Medicinal Properties
*T. cordifolia* is widely used in traditional Ayurvedic medicine in India, it has shown a lot of promise in terms of developing biopharmaceutical products for the treatment of a variety of illnesses (Kirti *et al*., 2004) [10]. Giloy is a stimulant that has sexual, diuretic, and alterative effects. It's a febrifuge that can be used to treat malaria and persistent fevers. It also has a stimulant effect on the liver. Studies on the plant have revealed antispasmodic,

anti-arthritic, antidiabetic, anti-periodic, anti-inflammatory, antioxidant, antistress, anti-allergic, antimalarial, hepatoprotective, antileprotic, antineoplastic, and immunomodulatory effects. (Neeraja and Margaret, 2013).

**Phytochemistry**

In Ayurveda medicine, almost every part of the plant is used. A fresh plant's potency is superior then that of a dried one. The plant's main components include alkaloids, glycosides, steroids, sesquiterpenoid, aliphatic molecule, essential oils, fatty acid combinations, and polysaccharides. Among the alkaloids are berberine, bitter gilonin, non-glycoside gilonin, and gilosterol (Singh *et al*., 2003) [17, 19]. The major alkaloid and secondary metabolites of giloy include tinosporine, tinosporide, tinosporaside, cordifolide, cordi fol, heptacosanol, and tinosporidine, which are effective in removing body toxins and stimulating the immune system (Singh *et al*., 2003) [17, 19]. Four innovative and seven documented chemicals were insulated from a methanol extract of *Tinospora cordifolia* aerial parts by phytochemical analysis. N-fo rmylasimilobine 2-O—D-glucopyranosyl-(12)—D-glucopyranoside (tinoscorside A) and N-acetylasimilobine 2-O—D-glucopyranosyl- (12)—D-glucopyranoside (tinoscorside B), as well as a novel clerodane diterpene, tinoscorside C (Upadhyay *et al*., 2011) [22]. The plant also contains a variety of vital minerals, including iron, copper, manganese, calcium, zinc, and phosphorus, in addition to its medicinal effects. *T. cordifolia* has a high fibre content (15.8%), protein content (4.5-11.2%), carbohydrate content (61.66%), and low fat content (3.1 %). *T. cordifolia* has a nutritional value of 292.5 calories/ 100 grammes. It has a high potassium concentration (0.845%), a high chromium content (0.06%), a high iron content (0.28%), and a high calcium content (0.845%). (0.845 %). 0.13% The leaf extract has been shown to have anti-HIV1 action. As a result, a natural extract from this plant will almost positively be effective in the prevention and treatment of virus-related infections in humans. *T. cordifolia's* dried bark has antispasmodic, antipyretic, anti-allergic, anti-inflammatory, and anti-leprotic effects. Humans are assumed to be unaffected by the plant. Alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic chemicals, and polysaccharides are among the physiologically active molecules that have been identified from several regions of the plant body.


**Fig 1:** Active Compounds of *Tinospora cordifolia*

**Cultivation Practices**

Giloy may be full-grown in a variety of soil types, extending from sandy to clay soil. However, the soil must be well-drained, moist, and ironic in organic matter in order for it to grow. It flourishes in a wide range of climate situations. The crop is grown up in a marshland setting. The plant is moderately rigid and can be grown at almost any temperature, but it selects a warm climate. Stem cuttings are the best planting material for commercial crop production. Planting is frequently done during the rainy season (July to August). Stem cuttings are planted in the field right away.

Nodes on mature stems are used to inhabit cuttings. Cuttings should be sown within 24 hours of being removed from the mother plant. In the meantime, they should be half-dipped in water vertically. A total of 2500 cuts are required to create a hectare of land. The plant can also be grownup from seeds. Seeds take twice as long to mature and generate the same amount of d rug as plants. A base dose of FYM (farmyard manure) @ 10 tonnes per 60 minutes and a semi dose of nitrogen (75 kg) are applied during field preparation. The node-rich stem cuttings are planted in the field right away. A spacing of 3 m 3 m is recommended for the optimal yield. The plant requires assistance to grow, which can be provided by wooden supports or a trellis. Two to three weeding and hoeing sessions are required for optimal twiner growth. There have been no serious insect pest infestations or illnesses in this crop. In the drop, when the stem has grown up to a width of more than 2.5 cm, it is harvested. The base fragment will be let to develop. Cut the stem into little pieces and dry it in the shade. The bark on the stem tears off even when touched, thus the stem should be cut very gently, as an unwrapped stem deteriorates quickly. In roughly two years, the plant produces around (10-15Q/Ha) 1500 kg of rejuvenated woody stem, which is reduced to 300 kilogramme of dry weight per hectare.

**Conclusion**

Tinospora is available in powder, liquid, and supplement form, all of which may be eaten. *Tinospora cordifolia* might be employed as a basis of key phytochemical compounds in the pharmaceutical industry in the future (Chaudhari and Shaikh, 2013) [4]. Humans have over-harvested this plant species, which has a lot of therapeutic potential. As a result, there is a strong desire to preserve it. Plant tissue culture techniques provide an another to quick propagation for preserving and promoting this plant's secondary products.

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