Chapter 46
Tinospora cordifolia (Willd.) Miers. (Menispermaceae): Beneficial Effect on Skin Diseases

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Key Points

- *Tinospora cordifolia (Willd.)* has been one of the most important plants used in folk medicine.
- *T. cordifolia* is used in various skin diseases and other ailments.
- *Gudduchi ghritha* and *gudduchi taila* have been used since time memorial in treatment of psoriasis.
- *T. cordifolia* is used in treatment of ringworm infections, skin neoplasms, leprosy, acne, chickenpox, and scabies.

Keywords *Tinospora cordifolia* • Skin diseases • Rasayna

Introduction

Tinospora cordifolia (Willd.) is well known as *guduchi* or heartleaf moonseed and belongs to family Menispermaceae. Its stem and roots are normally used for their medicinal properties. The plant grows well in tropical areas with warm humid climate and well-distributed rainfall. It grows in distinguished types of soils; silty soils on river banks are most ideal. *Guduchi* is an Indian medicinal plant and has been used in ayurvedic preparations for the treatment of various ailments throughout the centuries. Ancient Hindu physicians prescribed it for gonorrhea. *T. cordifolia* and similar species, i.e., *Tinospora crispa* and *Tinospora rumphii Boerl*, are used in ayurvedic herbal medicine as a hepatoprotective and as an immunostimulant [1].

Botanical Description

Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida

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Order: Ranunculales
Family: Menispermaceae
Genus: *Tinospora*
Species: *Tinospora Cordifolia*
Synonym: *Cocculus cordifolius* Dec; *Menispermum cordifolium* Willd.; *Tinospora glabra* (N. Brum.) Merr.

Vernacular Names

English: Heartleaf moonseed
Sanskrit: *Guduchi, amrita, madhuparni*
Ayurvedic: *Guduuchi, guduuchikaa, guluuchi, amrita, amritaa, amritalataa, amritavalli*, *chinnaruuhaa, chinnodbhavaa, madhuparni, vatsaadani, tantrikaa, kundalin, guduuchi sattva* (starch)
Hindi: *Giloya, gurcha*
Arabic: *Gilo*
Unani: *Gilo, gulanchaa, sat-e-gilo* (starch)
Siddha: *Seenil, amrida-valli*
Folk: *Giloya* [2]

T. cordifolia is a glabrous, succulent, climbing shrub native to India. It is also found in Burma, China, and Sri Lanka. It thrives easily in the tropical region, often attains a great height, and climbs up the trunks of large neem trees. The stem of *T. Cordifolia* is rather succulent with long filiform fleshy aerial roots from the branches. The bark is gray with spiral and longitudinal deep clefts and the space between is spotted with large rosette-like lenticels. The wood is white, soft, and porous, and the freshly cut surface quickly assumes a yellow tint when exposed to air. The branches bear smooth heart-shaped leaves, unisexual greenish flowers in summer, and red berries in winter. The flowers are small and yellow or greenish yellow. In auxiliary and terminal racemes or racemose panicles, the male flowers are clustered and female are usually solitary. The drupes are ovoid, glossy, succulent, red, and pea sized. The seeds are curved. Fruits are fleshy and single seeded. Long threadlike aerial roots come up from the branches. The viscous sap is light yellow and has an odor and a nauseating bitter taste [1, 3].

Cultivation

It grows well in almost any type of soils under varying climatic conditions. The plant is cultivated by stem cutting in the months of May–June. It requires some support, preferably neem and mango trees. Periodical hoeing is done, both in the nursery and field as per requirement. The medicinal plants have to be grown without chemical fertilizers and use of pesticides. Organic manures like farm yard manure, vermi-compost, and green manure are used as per requirement of the species. To prevent diseases, biopesticides are used. The field after plantation should be irrigated periodically as and when required at weekly or fortnightly intervals. Mature plants are collected, cut into small pieces, and dried in shade. The yield obtained is approximately 8–10 quintal/ha [4].

Chemistry

A large number of compounds have been isolated from the aerial parts, stem, and roots of *T. Cordifolia*. In the early 1900s, giloin, gilenin, and gilosterol, as well as the bitter principles columbin, chasmanthin, and palmarin, were identified in the plant. A wide variety of sesquiterpenes and diterpenes have

been isolated from the stems of the plant. The major isolated compounds include the norditerpene furan glycosides cordiofolisides A, B, and C; the daucane-type sesquiterpenes tinocordifolin and tinocordifolioside; the furanoid diterpene glucosides palmatosides C and F, and amritosides; the clerodane diterpenoids cordioside, tinosponone, and tinocordioside; tinosporaside, a novel 18-norclerodane diterpene glucoside; and tinocordiside, a cadinane sesquiterpene glycoside. In addition, syringin, cordiol, cordioside, and phenylpropene disaccharides cordifoliosides A and B were identified as the active principles with anticomplement and immunomodulatory activities. The stems of the plant contain the alkaloid berberine. Cultures of the stem callus have the capability of synthesizing this compound. Ecdysterone, makisterone A, and 20 beta-hydroxyecdysone are phytoecdysones isolated from the aerial parts of the plant. Other constituents reported from *T. Cordifolia* include a phenolic lignan, octacosanol, nonacosan-15-one, heptacosanol, beta-sitosterol, tinosporidine, cordifol, cordifolone, magnoflorine, tembetarine, syringine and syringine apiosylglycoside, and a glucan polysaccharide. The roots of *T. Cordifolia* contain isocolumbin, palmatine, tetrahydropalmatine, magnoflorine, and jatrorrhizine [5].

Traditional Uses

According to *Nighantu*, *T. cordifolia* commonly known as *guduchi* is supposed to *amrita* (which means to rejuvenate the dead cells). The term refers to heavenly elixir, which was reputed to protect the celestial people from senescence and keep them eternally young. In Hindi, the plant is commonly known as *giloya*, which is a Hindu mythological term that refers to the heavenly elixir that has saved celestial beings from old age and kept them eternally young. The plant is used in ayurvedic "*rasayanas*" to improve the immune system and the body resistance against infections [6]. *T. cordifolia* has been used to treat general weakness, fever, dyspepsia, dysentery, gonorrhea, secondary syphilis, urinary diseases, impotency, gout, viral hepatitis, skin diseases, and anemia. In compound formulations, *guduchi* is used clinically to treat jaundice, rheumatoid arthritis, and diabetes. The root is considered to be a strong emetic and is used for bowel obstruction [1].

Stem	Lung cancer, antimicrobial, jaundice, anti-inflammatory, antidiabetic, antituberculosis, antinociceptive, immunostimulant, antimalarial, typhoid, chronic sinusitis, antifungal, antiulcer, anticancer, fever, flatulence, hypertension, leucorrhoea, and diarrhea
Leaf	Antioxidant
Aerial root	Hepatoprotective, anemia, blood purifier, brain development, antiepileptic, anti-HIV, gynecological disorders, and spleen disorders
Entire plant	Antivenom, cardiotonic
Bark	Antispasmodic, antipyretic, anti-allergic, anti-inflammatory, and anti-leprotic properties [6, 7]

Application of *T. cordifolia* in Skin Diseases

T. cordifolia (*guduchi*) is one of the most highly valued and common herbs in ayurvedic medicine. It has a rich history in the Indian subcontinent where it has been used and written about for thousands of years. It is considered one of the best *rasayanas* (adaptogens) and is unusual in its potent versatility. In recent years, significant progress has been attained regarding its biological activity and medicinal applications. *Guduchi*, as it is most commonly called, has been described as "one which protects the body." The Sanskrit and Hindi name *amrita* is derived from ancient Hindu scriptures where *amrita* was used to bring the dead back to life and keep gods from growing ill and old. It is no wonder that it is also referred to as "nectar of immortality" and "heavenly elixir." Hence it finds an important place in treatment of various skin disorders, which are as follows:

Psoriasis

Psoriasis is a fairly common skin disease which is regarded as immunologically based disease which combines dermal inflammation with secondary epidermal hyperplasia. It is characterized by thick, silvery white scales surrounded by a red, inflamed border. *Gudduchi ghritha* and *gudduchi taila* have been used since time memorial in treatment of psoriasis. The method of preparation of *gudduchi ghritha* and *gudduchi taila* includes preparing hot infusion from stem pieces of *T. cordifolia* which is given for the treatment of psoriasis. In addition stem powder is applied over affected areas in morning and evening for 6–7 days [8].

Scabies

Scabies is a contagious skin infection that occurs among humans and other animals. It is caused by a tiny and usually not directly visible parasite, the mite *Sarcoptes scabiei*, which burrows under the host's skin, causing intense allergic itching. The infection in animals (caused by different but related mite species) is called sarcoptic mange. The disease may be transmitted from objects but is most often transmitted by direct skin-to-skin contact, with a higher risk with prolonged contact. Initial infections require 4–6 weeks to become symptomatic. Reinfection, however, may manifest symptoms within as little as 24 h. Because the symptoms are allergic, their delay in onset is often mirrored by a significant delay in relief after the parasites have been eradicated. Crusted scabies, formerly known as Norwegian scabies, is a more severe form of the infection often associated with immunosuppression. Paste prepared from *T. cordifolia* stem ash is applied over affected areas in scabies. Decoction of stem pieces of *T. cordifolia* is given to the patient suffering from scabies. Also stem powder is applied over affected areas in morning and evening for 6–7 days [8].

Ringworm

Ringworm or dermatophytosis is a clinical condition caused by fungal infection of the skin in humans, pets such as cats, sheep, and cattle. The term "ringworm" is a misnomer, since the condition is caused by fungi of several different species and not by parasitic worms. The fungi that cause parasitic infection (dermatophytes) feed on keratin, the material found in the outer layer of skin, hair, and nails. These fungi thrive on skin that is warm and moist, but may also survive directly on the outsides of hair shafts or in their interiors. In pets, the fungus responsible for the disease survives in skin and on the outer surface of hairs. The stem of *T. cordifolia* is crushed and the juice is applied externally to ringworm. A very potent activity is seen in treatment of ringworm infections [9].

Chicken Pox

Chicken pox is a highly contagious illness caused by primary infection with varicella zoster virus (VZV). It usually starts with vesicular skin rash mainly on the body and head rather than at the periphery and becomes itchy, raw pockmarks, which mostly heal without scarring. A person with chicken pox is infectious 1–2 days before the rash appears. The contagious period continues for 4–5 days after the appearance of the rash, or until all lesions have crusted over. Immunocompromised patients are probably contagious during the entire period and new lesions keep appearing. Crusted lesions are not contagious. It takes from 10 to 21 days after contact with an infected person for someone to develop

chicken pox. This disease is mainly characterized by immunosuppression of the body, but *T. cordifolia* is an immunostimulant property. So the stem extract of this plant helps in reducing the disease progression synergistically with other drugs. The dosing of the extract depends on the severity, age, and immunity of the diseased. *T. cordifolia* serves as a secondary line of treatment in chicken pox eradication [10].

Leprosy

Leprosy or Hansen's disease is a chronic disease caused by the bacteria *Mycobacterium leprae* and *Mycobacterium lepromatosis*. Named after the physician Gerhard Armauer Hansen, leprosy is primarily a granulomatous disease of the peripheral nerves and mucosa of the upper respiratory tract; skin lesions are the primary external sign. Left untreated, leprosy can be progressive, causing permanent damage to the skin, nerves, limbs, and eyes. In ayurveda whole plant of *T. cordifolia* has been used to treat the infectious leprosy disease. Every part of the plant *T. cordifolia* proves effective in treating the underlying causes of leprosy. *T. cordifolia*, though cannot cure the actual cause of the infection, proves beneficial in avoiding the secondary infections following the invasion of *M. leprae* [11].

Acne

Acne vulgaris (or cystic acne) is a common human skin disease, characterized by areas of skin with seborrhea, comedones papules (pinheads), pustules (pimples), nodules, and possibly scarring. Acne affects mostly skin with the densest population of sebaceous follicles; these areas include the face, the upper part of the chest, and the back. Severe acne is inflammatory, but acne can also manifest in noninflammatory forms. The lesions are caused by changes in pilosebaceous units, skin structures consisting of a hair follicle and its associated sebaceous gland, and changes that require androgen stimulation. *Propionibacterium acnes* and *Staphylococcus epidermidis* are common pus-forming microbes responsible for the development of various forms of acne vulgaris [12].

T. cordifolia in treatment of acne vulgaris with new polyherbal formulations, where *T. cordifolia* is an active constituent. One hundred and five patients with active lesions of acne vulgaris were included in the open clinical trial. The grading of acne vulgaris was as follows: Grade I: Mild acne with only papules; Grade II: moderate acne with papules and comedones; Grade III: severe acne with papules and pustules; Grade IV: very severe acne with papules, pustules, and cysts. All the patients were administered Purim tablets (*Azadirachta indica*, *T. cordifolia*, *Embelia ribes*, *Eclipta alba*, *Andrographis paniculata*, *Curcuma longa*, *Cassia fistula*, and *Triphala*), at a dose of two tablets twice daily for 4 weeks. Simultaneously, they were instructed to apply Clarina cream twice daily on the affected area of acne lesion twice daily for 4 weeks. The response to treatment was excellent in Grades I and II after 4 weeks of treatment. In Grade III acne with large papules and pustules, the response was also significantly good, in healing the papules and pustules. The Grade IV acne required other adjuvant treatment. There were no local or systemic side effects seen in all these patients. Thus, Clarina cream along with Purim tablets was useful in treating patients with various degrees of acne [13].

Skin Carcinogenesis

Skin neoplasms (also known as "skin cancer") are skin growths with differing causes and varying degrees of malignancy. The three most common malignant skin cancers are basal cell cancer, squamous

cell cancer, and melanoma, each of which is named after the type of skin cell from which it arises. Skin cancer generally develops in the epidermis (the outermost layer of skin), so a tumor can usually be seen. This means that it is often possible to detect skin cancers at an early stage.

T. cordifolia (guduchi) was used to explore antitumor promoting activity in a two-stage skin carcinogenesis model. For this purpose, mice were treated by single application of 7,12-dimethylbenz(a) anthracene (DMBA) (100 μg/100 μl of acetone) and 2 weeks later promoted by croton oil (1% in acetone three times a week) until the end of the experiment (i.e., 16 weeks). Oral administration of *T. cordifolia* extract at the preinitiational stage (i.e., 7 days before and 7 days after DMBA application; group IV), promotional stage (i.e., from the time of croton oil application; group V), and both pre- and postinitiational stage (i.e., from the time of DMBA application and continued until the end of the experiment; group VI; on the shaven backs of the mice at the dose of 100 mg/kg body weight/day for 16 weeks) recorded significant reduction in tumor weight and tumor incidence in comparison to control (i.e., mice treated with DMBA and croton oil; group III). Furthermore, cumulative number of papillomas, tumor yield, tumor burden, and tumor weight showed significant reduction along with significant elevation of phase II detoxifying enzymes, and inhibition of lipid peroxidation in liver and skin in the animals administered with *T. cordifolia* extract concomitant to carcinogen exposure. *T. cordifolia* extract has antitumor potential in a two-stage skin carcinogenesis mouse model [14].

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