

PHARMACOLOGICAL ACTIVITY OF TINOSPORA CORDIFOLIA

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Summary

Tinospora cordifolia is a large glabrous, succulent, deciduous climbing shrub belonging to family Menispermaceae. It is described as the one who protects the body against diseases. It is one of the most versatile rejuvenating herbs; it promotes longevity hence called *Vayastha*. Sanskrit name Guduchi itself means the one which protects our body. Another Sanskrit name, 'Amrita' means as it is extremely useful in strengthening the immunity of body and keeping the functions of various organs of the body in harmony. It is distributed throughout tropical Indian subcontinent, srilanka and China, ascending to an altitude of 300 m. Its therapeutic strength lies in its rejuvenating and strengthening properties while also detoxifying and cleansing the whole system, specifically via liver.

Key words: Guduchi, Arthritis, Antipyretics, Giloe.

Introduction

Tinospora cordifolia is a large glabrous, succulent, deciduous climbing shrub. It is distributed throughout tropical Indian subcontinent, srilanka and China, ascending to an altitude of 300 m [1]. In Sanskrit plant named is amrita, guduchi. In Hindi, the plant is commonly known as Giloe.

The stem of *Tinospora cordifolia* is rather succulent with long filiform fleshy aerial roots from the branches. The bark is creamy white to grey, deeply left spirally, the space in between being spotted with large rosette like lenticels. The leaves are membranous and cordate. The flowers are small and yellow or greenish yellow. Its stems are Fleshy and roots are long thread like, aerial, arise from branches. Bark is thin, grayish or creamy white in colour, when peeled fleshy stem is exposed. Its seeds are curved, pea sized. Recent studies showed columbine, chasmanthin, palmarin bitter principles are present in the drug [2, 3 and 4]. It is used as appetizer, febrifuge, stomachic, cardiogenic, expectorant, anthelmintic and adaptogen [5].



Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Order : Ranunculales
Family : Menispermaceae
Genus : *Tinospora*
Species : *T. cordifolia*

CULTIVATION OF TINOSPORA CORDIFOLIA [6]

Soil and climate

It grows well in almost any type of soils and under varying climatic conditions.

Nursery raising and planting

The plant is cultivated by stem cutting in the month of May-June. It requires some support preferably Neem and Mango trees, such plants are supposed to possess better medicinal values.

Weeding and hoeing

Periodical hoeing is done, both in the nursery and field as per requirement.

Manures, Fertilizers and pesticides

The medicinal plants have to be grown without chemical fertilizers and use of pesticides. Organic manures like, Farm Yard Manure (FYM), Vermi-Compost, Green Manure etc. may be used as per requirement of the species. To prevent diseases, bio-pesticides could be prepared (either single or mixture) from Neem (kernel, seeds & leaves), Chitrakmool, Dhatura, Cow's urine etc.

Irrigation

The field after plantation should be irrigated periodically as and when required weekly or fortnightly.

Harvesting/post harvesting operation

Mature plants are collected, cut into small pieces and dried in shade.

Yield

Approximately 8-10 q. /ha.

Macroscopical and microscopical study of *Tinospora Cordifolia* (Stem)



The drug occurs as long, cylindrical, glabrous, soft wooded pieces which show characteristic nodal swelling. The fresh stems are greenish with a smooth surface but the older stems have a brownish warty surface due to the presence of circular lenticels. Fracture is fibrous, taste bitter and odorless [7, 8].

Colour- Pale green to brownish green.

Odour- odourless.

Taste- Intensely bitter.

Fracture- Fibrous.

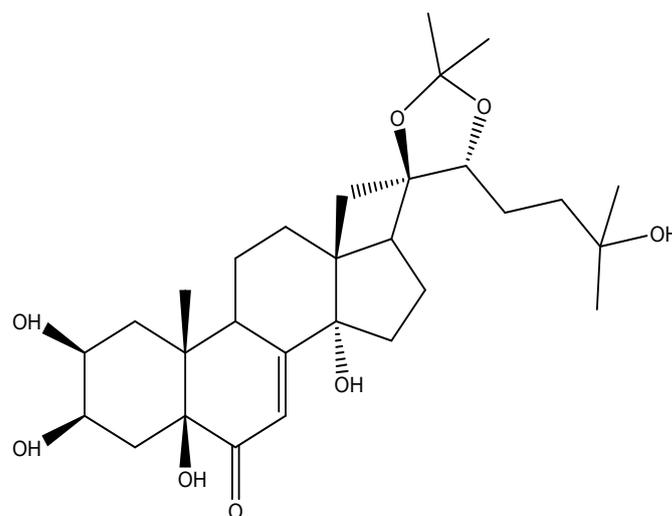
Transverse Section of stem shows 2-3 layers of cork cells with brownish pigment followed by two layers of collenchymatous cortex & 4-6 layers of parenchymatous cortex consisting of circular to is diametric type of cells. 7-9 layers of lignified pericycle fibres forming a continuous circle of arches. Vascular bundles are 16-20 open & collateral, surrounded by pericycle fibres. It consists of -

- Phloem- Appears like caps over metaxylem .Calcium oxalate crystals is also present. It Contains sieve tube, companion cells, phloem parenchyma.
- Xylem- Appears as wedge shaped patches separated by multiseriate modularly rays.
- Pitted xylem vessel in large number & tracheids, xylem parenchyma in less number.
- Medullary rays 15-20 or more cells wide containing rounded ,hemispherical, oblong, Ovoid starch grains.
- Pith composed of large, thin walled parenchymatous cells with starch grains [9].

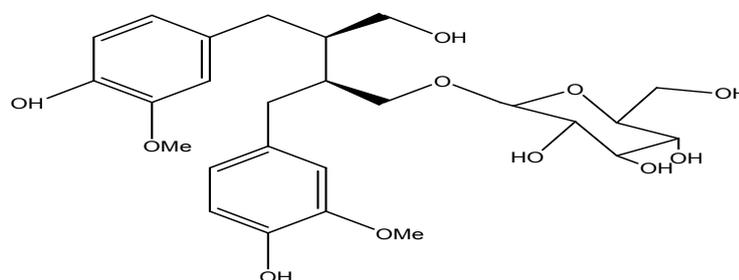
Chemistry of *Tinospora Cordifolia*

A variety of constituents have been isolated from *Tinospora cordifolia* plant. They belong to different classes such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides. Leaves of this plant are rich in protein (11.2%) and are fairly rich in calcium and phosphorus [10, 11].

Different constituents reported include a glycoside, alkaloids, bitter principles, crystalline components etc. The bitter principles have been identified as columbin, chasmanthin and palmarin. The alkaloid tinosporin, borapetoside F, borapetoside B , syringin , polypodine B - 20,22-acetonide, angelicoidenol 2-O- β -D-apiofuranosyl-(1 \rightarrow 6)- β -D-glucopyranoside, secoisolariciresinol-9'-O- β -D-glucopyranoside, and pinosresinol-di-O-glycoside also have been isolated from cordifolia [12-18]. The active constituents are diterpene compounds including tinosporone, tinosporic acid, cordifolisides A to E, the yellow alkaloid, berberine, Giloin, crude Giloininand, a glucosidal bitter principle as well as polysaccharides, including arabinogalactan polysaccharide (TSP). Picrotene and bergenin were also found in the plant.



Polypodine B 20,22-acetonide



Secoisolariciresinol-9'-O-β-D-glucopyranoside

PHARMACOLOGICAL ACTION

- The aqueous extract of guduchi stem has shown the presence of arabinogalactan that showed immunological activity. According to recent report, arabinogalactan polysaccharide (G1-4A) from the stem, appear to induce tolerance against endotoxic shock by modulation of cytokines and nitric oxide. In addition, it also modulates the release of nitric oxide by marine macrophages. The immunostimulating signaling mechanism of the novel (1, 4)-alpha-d-glucan reported to be through the activation of

macrophages that occurs through TLR6 signaling, NF-kappa B translocation and cytokine production^[20].

- The stem is used in dyspepsia fevers and urinary diseases. It has multiple actions like; stem is a bitter stomachic; stimulates bile secretion; causes constipation; tonic; allays thirst, fever, burning sensation, prevents vomiting; diuretic; enriches the blood; cures jaundice; useful in skin diseases; the juice is useful in diabetes, vaginal and urethral discharges, low fevers, and enlarged spleen. The root and stem are prescribed in combination with other drugs as an antidote to snake bite and scorpion sting. An infusion of the powdered stem is used as an alternative and tonic and has enjoyed the reputation among ancient Hindu writers of being an aphrodisiac^[21].
- The bitter principle present shows antiperiodic, antispasmodic, anti-inflammatory and antipyretic properties^[22-24].
- Guduchi has been reported to treat throat cancer in humans. Polysaccharide fraction from guduchi is found to be very effective in reducing the metastasis potential of B16F-10 melanoma cells^[25].
- Dichloromethane extract is the most promising one as far as cytotoxic effect is concerned. Extracts of *Tinospora cordifolia* (TCE) have been shown to possess anti-tumor properties and was shown to up regulate antitumor activity of tumor-associated macrophages (TAM). Evidence has shown that an alcoholic extract of *Tinospora cordifolia* (ALTC) enhances the differentiation of TAM to dendritic cells (DC) in response to granulocyte/macrophage-colony-stimulating factor, interleukin-4, and tumor necrosis factor^[26].
- Water extract of the plant is proved to reduce edema and arthritis^[27].
- It also has antipyretic action and is a morphine potentiator and leads to reduction in blood and urine glucose, and lipids in serum and tissues sugar in alloxan induced diabetic rats and rabbits^[28, 29].
- This drug relaxes the intestinal and uterine smooth muscles. Blood urea levels in uraemic dogs and human subjects were also decreased^[30]. It is proved effective in prevention of fibrosis and in stimulating regeneration in hepatic tissue^[31].
- It has been extensively reported as a general tonic, antispasmodic, anti-inflammatory, antiarthritis, antiallergic, hepatoprotective and antidiabetic agent^[32].

- A recent report demonstrated an endocrine activity of TC since the extract exerted an antiosteoporotic activity in the postmenopausal osteoporosis rat model^[33]. Also in the male, TC may have hormonal activity because treatment of adult male rats with TC affected sperm quality and weight of testes and prostate^[34]. With regard to the prostate it is not known whether this is a direct effect of TC or whether this effect is induced by altered hormone release. Therefore we investigated the effects of an ethanolic extract of TC on the proliferation of the human prostate cancer cell line LNCaP, which is a well-accepted in vitro model to study endocrine actions of test compounds in the prostate^[35].
- The different parts of TC are used in immunomodulatory property as an adjuvant therapy in diabetic patients with foot ulcers. In a prospective double blind randomized controlled study lasting for over 18 months in 50 patients, produced significantly better outcome with improvement in wound healing, indicating beneficial effects of immunomodulation for ulcer healing^[36].
- The alcoholic root extract significantly reduces the blood and urine glucose, and lipids in serum and tissues in alloxan induced diabetic rats. The extract also prevents decrease in body weight^[37].

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