

## PHARMACOLOGICAL ACTIVITY OF TINOSPORA CORDIFOLIA

Sushila Gupta\*, Ranjit Singh, V. D.Ashwlayan

School of Pharmaceutical Sciences, Shobhit University, NH-58, Modipuram, Meerut-250005.

(U P) India

### \*Corresponding Author

#### Sushila Gupta

M.Pharm (Research Scholar)

Department of School of Pharmaceutical Sciences;

Shobhit University, NH-58, Modipuram, Meerut

Mobile no: +917275990838

Meerut- 250001; U.P., India

Email: [sushilagupta86@gmail.com](mailto:sushilagupta86@gmail.com)

### 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.

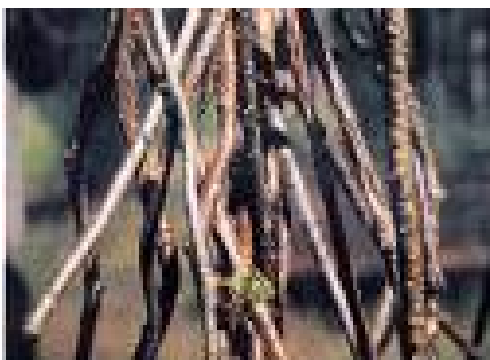
### **Harvesting/post harvesting operation**

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.

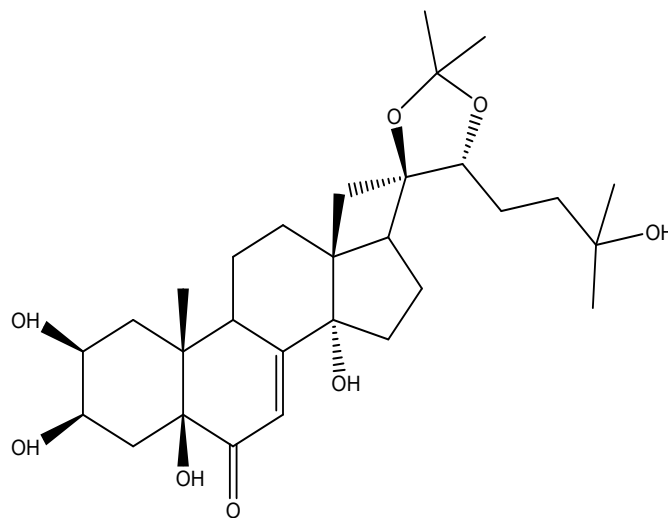
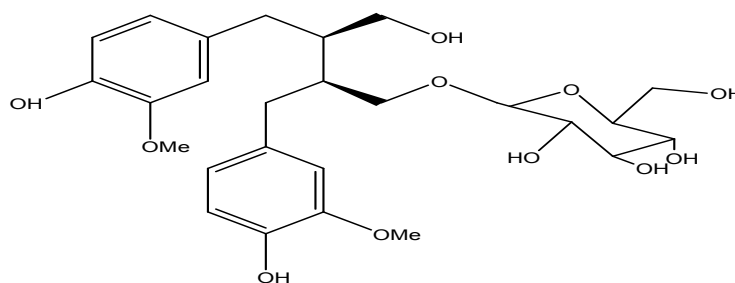
Transverse Section of stem shows 2-3 layers of cork cells with brownish pigment followed by two layers of collenchymatous cortex & 4-6 layers of parenchymatous cortex consisting of circular to is diametric type of cells. 7-9 layers of lignified pericycle fibres forming a continuous circle of arches. 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- $\beta$ -D-apiofuranosyl-(1 $\rightarrow$ 6)- $\beta$ -D-glucopyranoside, secoisolariciresinol-9'-O- $\beta$ -D-glucopyranoside, and pinoresinol-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<sup>[20]</sup>.

- 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<sup>[21]</sup>.
- The bitter principle present shows antiperiodic, antispasmodic, anti-inflammatory and antipyretic properties<sup>[22-24]</sup>.
- 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<sup>[25]</sup>.
- 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<sup>[26]</sup>.
- Water extract of the plant is proved to reduce edema and arthritis<sup>[27]</sup>.
- 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<sup>[28, 29]</sup>.
- This drug relaxes the intestinal and uterine smooth muscles. Blood urea levels in uraemic dogs and human subjects were also decreased<sup>[30]</sup>. It is proved effective in prevention of fibrosis and in stimulating regeneration in hepatic tissue<sup>[31]</sup>.
- It has been extensively reported as a general tonic, antispasmodic, anti-inflammatory, antiarthritis, antiallergic, hepatoprotective and antidiabetic agent<sup>[32]</sup>.

- A recent report demonstrated an endocrine activity of TC since the extract exerted an antiosteoporotic activity in the postmenopausal osteoporosis rat model<sup>[33]</sup>. 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<sup>[34]</sup>. 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<sup>[35]</sup>.
- 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<sup>[36]</sup>.
- 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<sup>[37]</sup>.

### References

1. [http://en.wikipedia.org/wiki/Tinospora\\_cordifolia](http://en.wikipedia.org/wiki/Tinospora_cordifolia)
2. The wealth of India raw materials, A dictionary of Indian raw materials and industrial Products, Council of scientific and industrial research, New Delhi, 2003, 10, 251-252.
3. Kulkarni P.H., The Encyclopedia of Ayurveda, Sri Satguru publication, 2005, 1, 288-289.
4. Kirtikar K.R., Basu B.D., Indian medicinal plant, International book distributors, 2005, 1, 77-80.
5. Chaudhari R.D., Herbal drugs Industry, Eastern publishers, 1996: 474.
6. [http://portal.ics.trieste.it/MAPs/MedicinalPlants\\_Plant.aspx?id=660#General](http://portal.ics.trieste.it/MAPs/MedicinalPlants_Plant.aspx?id=660#General)
7. Wallis T.E., "Practical Pharmacognosy", J & A Churchill ltd, 1920, 184 -185.

8. Mukherjee Dr., Pulok K., "Quality control of Herbal drugs", Business horizons pharmaceutical Publishers, 2002, 132-148,161-164,183.193, 428-464.
9. Rangari vinod D., "Pharmacognosy & Phytochemistry", Vol I, second edition, career publication, 69-71, 95-96, 105-106, 237.
10. Zhao TF., Wang X., Rimando AM., Che C., Folkloric medicinal plants, *Tinospora sagittata* var, *cravaniana* and *Mahonia bealei*, *Planta Med.* 1991, 57, 505.
11. Khosa RL., Prasad S., Pharmacognostical studies on Guduchi (*Tinospora cordifolia* Miers), *J Res Ind Med* 1971, 6, 261-9.
12. Fukuda N., Yonemitsu M., Kimura T., *Liebig's Ann Chem.*, 1993:491.
13. Martin TS., Ohtani K., Kasai R., Yamasaki K., *Phytochemistry*, 1996, 42,153.
14. Cavin A., Hostettmann K., Dyatmyko W. Potterat O., *PlantaMed*, 1998, 64, 393.
15. Pis J., Budesinsky M., Vokac K., Laudova V., Harmatha J., *Phytochemistry*, 1994, 37, 707.
16. Kitajima J. Okamura C., Ishikawa T., Tanaka Y., *ChemPharmBull.* 1998, 46, 1595.
17. Inoshiri S., Sasaki M., Kohda H., Otsuka H., Yamasaki K., *Phytochemistry*, 1987, 26, 2811.
18. Konishi T., Wada S., Kiyosawa S., *Yakugaku Zasshi.*, 1993, 113, 670.
19. European Pharmacopoeia, 5<sup>th</sup> edition published 15 June 2004 page no. 215-222.
20. Chinaware G., Jain A., Sipahimalani A., Banerji A., Sumariwalla P., Ramakrishna R., et al. An immunologically active arabinogalactan from *Tinospora cordifolia* *Phytochemistry*, 1999, 52, 1089-93.
21. Thatte UM., Kulkarni MR., Dahanukar SA., Immunotherapeutic modification of *Escherichia coli* peritonitis and bacteremia by *Tinospora cordifolia*, *J Post grad Med.* 1992, 38, 13.
22. Dahanukar SA., Thatte UM., Pai NR., More PB., Karandikar SM., Immunotherapeutic modification by *Tinospora cordifolia* of abdominal sepsis induced by caecal ligation in rats. *Ind J Gastroenterology*, 1988, 7, 21-3.
23. Jagetia GC., Nayak V., Vidyasagar MS., Evaluation of the antineoplastic activity of guduchi (*Tinospora cordifolia*) in cultured HeLa cells, 1998, 127, 71-82.
24. Chauhan K., Successful treatment of throat cancer with Ayurvedic drugs Suchitra *Ayurved* 1995, 47, 840-2



25. Nisha Singh, Singh, S. M., Pratima Shrivastava. Effect of *Tinospora cordifolia* on the antitumor activity of tumor-associated macrophages-derived dendrite cells. *Immunopharmacology and Immunotoxicology*, 2005, 27, 1-14.
26. Pendse V.K., et al. *Ind.J.Pharmacol* 1997, 9, 221.
27. Pendse V.K., et al. *Ind.Drugs*.1981, 14.
28. Gulati O.D.et al. *Rheumatism*.1982, 17, 76.
29. Raghunathan I., et al. *J.Res.Med*.1969, 3, 201.
30. Singh K.P., et al.*J.Res.Ind.Med*.1975, 10, 9.
31. Rege N., et al. *Ind.Drugs*.1984, 544.
32. Gupta S.S., Verma S.L.L., Garg V.P., Anti-diabetic effect of *T. cordifolia*. Part I: Effect on fasting blood level, glucose tolerance and adrenaline induced hyperglycemia, *Indian J. Med. Res* 1967, 55, 733-745.
33. Kanpur P., Jarry H., Wuttke W., Pereira B.M.J., Seidlova-Wuttke D., Evaluation of the antiosteoporotic potential of *Tinospora cordifolia* in female rats. *Maturitas* 2008, 59, 329-338.
34. Gupta R.S., Sharma A., Antifertility effect of *Tinospora cordifolia* (Wild.) stem Extract in male rats, *Indian J. Exp. Biol* 2003, 41 (8), 885-889.
35. Steenbrugge G.J., Groen M., van Dongen J.W., Bolt J., van der Korput H., Trapman J., Hasenson M., Hor-oszewicz J., The human prostatic carcinoma cell line LNCaP and its derivatives. An overview. *Urol. Res.* 1989, 17, 71-77.
36. Purandare H., Supe A., Immunomodulatory role of *Tinospora cordifolia* as an adjuvant in surgical treatment of diabetic foot ulcers, A prospective randomized controlled study, *Indian J Med Sci.* 2007, 61 (6), 347-55.
37. Stanely M., Prince P., Menon VP., Hypoglycemic and hypolipidaemic action of alcohol extract of *Tinospora cordifolia* roots in chemical induced diabetes in rats, *Phytother Res.* 2003, 17 (4), 410-13.