

Review

Medicinal use of the unique plant *Tinospora Cordifolia*: evidence from the traditional medicine and recent research

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Abstract: *Tinospora cordifolia* is commonly known as Gulancha in Bangladesh is belongs to Menispermaceae family and it is also available all over the world. It is widely used as a unique ingredient of various natural medicine and traditionally use for numerous ailment like fever, vomiting, diabetes, jaundice, anaemia, polyuria and skin diseases etc. It has hypoglycemic, antipyretic, anti-allergic, Antineoplastic, anti inflammatory, anti-oxidant, and immuno modulatory properties. A variety of constituents have been isolated from different parts of *Tinospora cordifolia*, mainly contains alkaloids like Aporphine alkaloids, clerodane diterpenes, berberine, palmatine, tembertarine, tinosporin, magniflorine, choline, Berberine, Palmatine, Tembatarine, Magnoflorine Choline, Tinosporin etc. and Glycoside like Tinocordiside, Tinocordifolioside, steroids, essential oils, mixture of fatty acids and polysaccharides are found in Gulancha plant. This review presents a detailed survey of the literature on traditional and modern knowledge of *Tinospora cordifolia* for health benefit.

Keywords: *Tinospora cordifolia*; Gulancha; traditional medicine; immunomodulator; alkaloids

1. Introduction

Medicinal plants have played an important role of healthcare for much people based on a combination of time tested traditional usage and ongoing scientific research. *Tinospora Cordifolia* is a large, glabrous, deciduous, climbing shrub. The stem structure is fibrous and the transverse section exhibits a yellowish wood with radially arranged wedge shaped wood bundles, containing large vessels, separated by narrow medullary rays. The bark is creamy white to grey, deeply left spirally and stem contains rosette like lenticels. The leaves are membranous and cordate in shape. Flowers are in axillary position, 2-9 cm long raceme on leaflet branches, unisexual, small and yellow in color. Male flowers are clustered and female are usually solitary. The seeds are curved. Fruits are fleshy and single seeded. Flowers grow during the summer and fruits during the winter (Sharma *et al.*, 2010). It is found throughout India and also in Srilanka, Bangladesh and China (Meshram *et al.*, 2013).

2. Taxonomical classification

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida,

Order: Ranunculaceae

Family: Menispermaceae.

Genus: *Tinospora*

Species: *cordifolia* (Ali, 2007).

3. Vernacular names

Bengali: Gulancha

Arabic: Gilo

Hindi: Giloya, Guduchi

Urdu: Gilo

Sanskrit: Guduchi, Madhuparni, Amrita, Chinnaruha, Vatsadaani, Tantrika, Kundalini & Chakralakshanika

English: Gulancha / Indian tinospora

Telugu: Tippatiga

Tamil: Shindilakodi

Marathi: Shindilakodi

Gujarathi: Galo (Ali, 2007).

Parts used

Stems -The stem is bitter, stomachic, diuretic stimulates bile secretion, causes constipation, allays thirst, burning sensation, vomiting, enriches the blood and cures jaundice (Meshram *et al.*, 2013).

Roots - The root and stem of *T. cordifolia* are prescribed in combination with other drugs as an anti-dote to snake bite and scorpion sting (Meshram *et al.*, 2013).

Leaves - Juice or decoction of leaves is administered orally with honey in fever (Shah, 1984).

4. Chemical composition

Constituents isolated from *Tinospora cordifolia* belong to different classes such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides (Meshram *et al.*, 2013). Other compounds that have been isolated from *Tinospora cordifolia* are tinosporone, tinosporic acid, cordifolisides A to E, syringen, berberine, giloin, gilenin, crude giloininand, arabinogalactan polysaccharide, picrotene, bergenin, gilosterol, tinosporol, tinosporidine, sitosterol, cordifol, heptacosanol, octacosanol, tinosporide, columbin, chasmanthin, palmarin, palmatosides C and F, amritosides, cordioside, tinosponone, ecdysterone, makisterone A, hydroxyecdysone, magnoflorine, tembetarine, syringine, glucan polysaccharide, syringine apiosylglycoside, isocolumbin, palmatine, tetrahydropalmatine, jatrorrhizine respectively (Sharma *et al.*, 2010). It also contains Flavonoids, glycosides, saponins and some amount of phytosterols. These active constituents alone or in combination may be responsible for the observed antioxidant activity (Onkar *et al.*, 2012). This family is rich source of alkaloids and terpenes (Spandana *et al.*, 2013). Leaves of this plant are rich in protein (11.2%) and are fairly rich in calcium and phosphorus (Khosa and Prasad, 1971).

5. Toxicology

Very less is known about the toxicology of *Tinospora cordifolia* in humans. No adverse effect was observed when the extract of *Tinospora cordifolia* stem was administered to rabbits up to the highest oral doses of 1.6 g/kg, and in rats at doses of 1,000 mg/kg of the whole plant extract. But when 500mg/kg body weight of *Tinospora* stem extract were given to mice, 40% mortality occurred (Neeraja and Margaret, 2013).

6. Important formulation

Gilo is one of the chief ingredient of some herbal medicine product which are being used to manage various ailment; few well known products having Gilo as chief ingredient are Safoof-e-Gilo, Safoof-e-Ziabetus, Satt-e-Gilo and Arq Maul Laham Mako-kashiwala (BNUF, 2010). Guduchyadi churna, Dashmoolarishtha, Sanjivani vata, Chyavanparasha, Guduchi ghrita, Brihat guduchi taila, etc (BNAF, 2010).

7. Dose

In powder form 3-6 g of the drug

In decoction form 20-30 g of the drug (Sharma, 1999).

8. Pharmacological activity

In the history of traditional medicine using *Tinospora cordifolia* has revealed it to have pharmacological value as Hypoglycemic, anti-inflammatory, hepatoprotective, immune-modulator activity, anti-oxidant, antitumour activity, Antineoplastic and has antifertility activity.

8.1. Hypoglycemic activity

Oral administration of the water extract of *Tinospora cordifolia* root caused a significant reduction in blood glucose, brain lipid level, hepatic glucose-6-phosphatase, serum acid phosphatase, alkaline and lactate dehydrogenase and increase in body weight, total haemoglobin and hepatic hexokinase in alloxanized diabetic rats (Stanely *et al.*, 2000).

8.2. Anti allergic activity

In a clinical study, 100% relief was reported from sneezing in 83% of the patients on treatment with *T. cordifolia*. Thus *Tinospora cordifolia* significantly decreased all symptoms of allergic rhinitis and was well tolerated (Badar *et al.*, 2005).

8.3. Cardioprotective activity

A dose-dependent reduction in infarct size and in serum and heart lipid peroxide levels was observed with prior treatment with *Tinospora cordifolia* in ischemia-reperfusion-induced myocardial infarction in rats (Rao *et al.*, 2005).

8.4. Hepatoprotective

The hepatoprotective action of *T. cordifolia* was reported in one of the experiment in which goats treated with *Tinospora cordifolia* have shown significant clinical and hemato-biochemical improvement in CCl₄ induced hepatopathy. Extract of *T. cordifolia* has also exhibited in vitro inactivating property against Hepatitis B and E surface antigen in 48-72 Hours (Mehrotra *et al.*, 2000).

8.5. Anti-stress and tonic property

The anti-stress and tonic property of the plant was clinically tested and it was found that it brought about good response in children with moderate degree of behavior disorders and mental deficit. It has also significantly improved the I.Q. levels (Singh *et al.* 2003).

8.6. Anti-inflammatory

The alcoholic extract of *Tinospora cordifolia* has been found to exert anti-inflammatory actions in models of acute and subacute inflammation (Wesley *et al.*, 2008).

8.7. Antineoplastic activity

Intraperitoneal injection of the alcoholic extract of *Tinospora cordifolia* has been shown to Dalton's lymphoma (DL) bearing mice stimulated macrophage functions like phagocytosis, antigen-presenting ability and secretion of Interleukin-1 (IL-1), tumour necrosis factor (TNF) and Reference Nutrient Intake (RNI) as well as slowed tumor growth and increased lifespan of the tumor-bearing host (Singh *et al.*, 2005).

8.8. Osteoprotective activity

Rats treated with *Tinospora cordifolia* showed an osteoprotective effect, as the bone loss in tibiae was slower than that in controls. Serum osteocalcin and cross-laps levels were significantly reduced. This study demonstrates that extract of *Tinospora cordifolia* has the potential for being used as anti osteoporotic agent (Kapur *et al.*, 2008).

8.9. Antifertility activity

Oral administration of 70% methanolic extract of *Tinospora cordifolia* stem to male rats at a dose level of 100 mg/d for 60 days did not cause body weight loss but decreased the weight of testes, epididymis, seminal vesicle and ventral prostate in a significant manner (Gupta and Sharma, 2003).

8.10. Anti ulcer activity

Treatment with a formulation containing *Tinospora cordifolia* has been shown to reduce ulcer index total acidity, with an increase in the pH of gastric fluid in pylorus-ligated rats and in the ethanol-induced gastric mucosal injury in rats (Bafna and Balaraman, 2005).

8.11. Anti leprotic activity

Tinospora cordifolia is used for its kushtahara (anti-leprotic) properties, along with wide use in Kandu and visarpa (types of skin disorders) and has been shown to exert anti -leprotic activity in a combination formulation (Asthana *et al.*, 2001).

8.12. Diuretic

Activity In a scientific study on rats and human volunteers, *Tinospora cordifolia* was found to have diuretic effects. It was also found effective in modulation of morphology and some gluconeogenic enzymes activity in diabetic rat kidney (Nagaraja *et al.*, 2007).

9. Safety aspect

Tinospora cordifolia is traditionally considered to be safe in the dose mentioned (Anonymous, 2003).

10. Conclusions

It is evident from the above review that the *Tinospora cordifolia* hold unique place in the traditional herbs based remedies. Although the results from this review are quite promising for the use of *Tinospora cordifolia* as a multi-purpose medicinal agent, several limitations currently exist in the current literature. More clinical trials on the basis of modern knowledge should be conducted to support its therapeutic use and acceptability. It is also noted that *Tinospora cordifolia* may be effective not only in isolation, but may actually have a potentiating effect when given in combination with other herbs or drugs in the interest of human health.

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Conflict of interest

None to declare.

Reference

- Ali H, 2007. Clinical evaluation of Safoof ziaabetes in management of Ziaabetes Shakri. Dissertation. Rajiv Gandhi University of Health Sciences (RGUHS), In Moalajat. Bangalore, Karnataka, India.
- Anonymous, 2003. Quality standareds of Indian Medicinal Plants, (Co-ordinator AK Gupta) (Indian Council of Medical Research, New Dilhi), 1: 212.
- Asthana, JG, S Jain, M Ashutosh and MS VijayKanth, 2001. Evaluation of antileprosy herbal drug combinations and their combinations with dapsone. *Indian Drugs*, 38: 82-86.
- Badar VA, VR Thawani, PT Wakode, MP Shrivastava, KJ Gharpure, LL Hingorani and RM Khiyani, 2005. Efficacy of *Tinospora cordifolia* in allergic rhinitis. *J. Ethnopharmacol.*, 96 : 445-449.
- Bafna PA and R Balaraman, 2005. Anti-ulcer and anti-oxidant activity of pepticare, a herbomineral formulation. *Phytomedicine*, 12: 264-270.
- Bangladesh National Unani Formulary, 2010.
- Bangladesh National Ayurvedic Formulary, 2010.
- Gupta RS and A Sharma, 2003. Antifertility effect of *Tinospora cordifolia* (Willd.) stem extract in male rats. *Indian J. Exp. Biol.*, 41: 885-889.
- Kapur P, H Jarry, W Wuttke, BM Pereira and D Seidlova- Wuttke, 2008. Evaluation of the antiosteoporotic potential of *Tinospora cordifolia* in female rats. *Maturitas*, 59: 329-338.
- Khosa RL and S Prasad, 1971. Pharmacognostical studies on Guduchi- *Tinospora cordifolia* Miers. *J. Res. Ind. Med.*, 6: 261-269.
- Mehrotra R, CK Katiyar and AP Gupta, 2000. Hepatoprotective composition and composition for treatment of conditions related to hepatitis Band E infection. *US Patent*, 6:136,316.
- Meshram A, SS Bhagyawant, S Gautam and N Shrivastava, 2013. Potential Role of *Tinospora Cordifolia* in Pharmaceuticals. *World J. Pharm. Sci.*, 2: 4615- 4625.
- Nagaraja PK, KF Kammar and S Devi, 2007. Modulation of morphology and some gluconeogenic enzymes activity by *Tinospora cordifolia* (Willd.) in diabetic rat kidney. *Biomed. Res.*, 18: 179 -183.
- Neeraja PV and E Margaret, 2013. Amruthavalli (*Tinospora cordifolia*) multipurpose rejuvenator. *Int. J. Pharm. Biol. Chem. Sci.*, 3: 233-241.
- Onkar P, J Bangar and R Karodi, 2012. Evaluation of Antioxidant activity of traditional formulation Giloy satva and hydroalcoholic extract of the *Curculigo orchioides* gaertn. *J. App. Pharma. Sci.*, 2: 209-213.
- Rao PR, VK Kumar, RK Viswanath and GV Subbaraju, 2005. Cardioprotective activity of alcoholic extract of *Tinospora cordifolia* in ischemia-reperfusion induced myocardial infarction in rats. *Biol. Pharm. Bull.*, 28: 2319-2322

- Shah GL, 1984. Some economically important plants of salsette island near Bombay. J. Econ.Taxon. Bot., 5: 753-756.
- Sharma A, A Gupta and SSA Batra, 2010. *Tinospora cordifolia* (Willd.) Hook. F.and Thomson-A plant with immense economic potential. J. chem. pharm. Res., 2: 327-333.
- Sharma PV, 1999. Dravyaguna Vijnan; Reprint Choukhamba Bharati Academy, Varanasi.
- Singh N, SM Singh and P Shrivastava, 2005. Immunomodulatory and antitumor actions of medicinal plant *Tinospora cordifolia* are mediated through activation of tumor-associated macrophages. Immunopharmacol. Immunotoxicol., 26: 145-162.
- Singh SS, SC Pandey, S Srivastava, VS Gupta, B Patro, AC Ghosh, 2003. Chemistry and medicinal properties of *Tinospora cordifolia*. Indian J. Pharmacol., 35: 83- 91.
- Spandana U, SL Ali, T Nirmala, M Santhi and SD Sipai Babu, 2013. A Review on *Tinospora cordifolia*. Int. J. of Current Pharm. Rev. Res., 4: 6-18.
- Stanely P, M Prince and VP Menon, 2000. Hypoglycemic and other related actions of *Tinospora cordifolia* roots in alloxan-induced diabetic rats. J. Ethnopharmacol., 70 : 9-15.
- Wesley JJ, AJ Christina and N Chidambaranathan, 2008. Effect of alcoholic extract of *Tinospora Cordifolia* on acute and subacute Inflammation. Pharmacologyonline, 3: 683-687.