



## GILO (*TINOSPORA CORDIFOLIA* (WILLD.) MIERS): A WONDER DRUG OF UNANI SYSTEM OF MEDICINE

Mohd Afsahul Kalam<sup>\*1</sup>, Arshia Noor<sup>2</sup>, Ifra Qayoom<sup>2</sup>, Riehana Gani<sup>3</sup>, Humma<sup>1</sup>

<sup>1,2</sup>Department of Ilmul Advia, RRIUM, Srinagar, University of Kashmir

Habak, Naseem Bagh, Srinagar, J&K 190006, India

### Review Paper

Received: 10.05.2021

Revised: 15.05.2021

Accepted: 22.06.2021

### ABSTRACT

Gilo or *Tinospora cordifolia* is considered as a wonder drug of Unani System of Medicine because of its broad-spectrum therapeutic properties. It is an herbaceous vine, commonly grown in tropical India, and is being widely used in AYUSH system and unorganized systems (folk, tribal, native) of medicine. It is a storehouse of various phyto constituents like alkaloids, terpenoids, glycosides, hormones, polysaccharides, steroids, minerals etc. Its main pharmacological properties are anti-pyretic, anti-diabetic, antioxidant, hepato protective etc. Now a days, Gilo is being extensively assessed for its immunomodulator activity and it is proving to be a promising herb in this respect. The current study presents a critical review on the morphology, habitat, phytochemistry, pharmacological actions and therapeutic uses of this medicinal plant as mentioned in the classical literature of Unani System of Medicine as well as to cover its recent researches.

No. of Pages: 8

References: 35

**Keywords:** Gilo, *Tinospora cordifolia*, phytoconstituents, therapeutic use, immunomodulatory, Unani Medicine.

### INTRODUCTION

*Tinospora cordifolia* (Willd.) Miers. is a woody climber belonging to family *Menispermaceae* [1,2]. The genus *Tinospora* consists of about 60 species. [3] It is a perennial climber, found throughout Tropical India, growing in deciduous and dry forests. The plant is usually collected during summer, preferably in the month of May. The drug consists of dried, mature pieces of stem of as well as the starch collected from its stem. [4] Whether the drug is given alone or in a compound form with other constituents, it successfully treats scores of ailments like *Humma-i-Damwi*, *Huma-i-Safrāwi* (fevers), *Alam* (pain), *Ātshak* (syphilis), *Sozāk* (gonorrhoea), *Harārat-i-Jigar* (hotness of liver), *Ghashī* (syncope), *Shozish-i-Qalb*, *Shozish-i-Jigar*, *Niqris* (gout), *Du'f al-Ishtihā'* (anorexia), *Dhayābitus Shakari* (Diabetes mellitus). Apart from the said diseases, it is also

highly beneficial for viral hepatitis, anemia, diarrhea, cough, dysuria, inflammation of various types, hypertension, snake bite, leucorrhoea, tuberculosis, spermatorrhoea, rheumatoid arthritis etc. In Ayurvedic system of medicine, it is used for the treatment of general debility, dyspepsia, fever and urinary diseases while in Chinese traditional medicine it finds its use in chronic rheumatism, ulcerative wounds and piles. [5] Gilo on one hand has a wide range of therapeutic application, but on the other hand has minimal toxicity as reported by Unani physicians [6], as a result of which it is considered to be relatively safe drug. Recent studies have recognised Gilo as a biological response modifier as it is known to potentiate/augment immune response probably due to macrophage activation, phagocytosis and other mechanisms [7,8]. The plant is a rich source of various chemical constituents like glycosides, hormones, diterpenoid lactones, sesquiterpenoids, essential oils, phenolic and aliphatic

\*Corresponding author: [afsahnium@gmail.com](mailto:afsahnium@gmail.com)

compounds and all the pharmacological and curative abilities of the plant can be ascribed to these phytochemicals.

### Methodology

For the literature review various Unani Books were searched by plant's name Gilo. For secondary information regarding ethnomedicinal uses, pharmacological studies, the plant was searched by the word *Tinospora cordifolia* in various search engines and scientific groups like google, google scholar, Research Gate, PubMed, PMC and Science direct etc. All material, from Unani Urdu books and scientific research papers were reviewed, and a framework was developed to represent the information available. Standard Unani Medical Terminology published by CCRUM, in collaboration with WHO was consulted for *Unani Istilahat* (terminologies).

### Distribution

It is found all over the world like China, North West, and parts of South-Africa, Malaysia, Indonesia, Andamans, Vietnam, Philippines, Thailand, Myanmar and It is widely distributed throughout India, Pakistan, Bangladesh, and Sri Lanka. [1,2,3,9]. In India in particular, it is abundantly found in deciduous and dry forests. [1]

### Cultivation and Collection

Gilo is usually found in tropical dry areas as it does not tolerate moist and humid climate. It can be grown under varying climatic conditions. It thrives well in almost all types of soils, from acid to alkaline [1,9]. Sandy loamy soil, rich in organic matter with good drainage is found to be good for higher yield of crop. It grows well in red to medium black soil [10,11]. It is cultivated at the onset of monsoon during May-June. [1] It requires 18°C to grow. Rainy season is best for plantation of this plant.

### Botanical description.

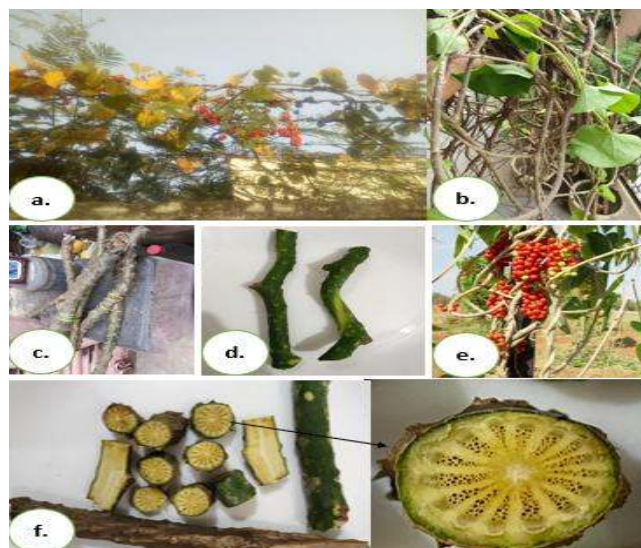
*Tinospora cordifolia* is a large deciduous, extensively spreading, twinning and widely climbing plant with a number of coiling branches. The stem slender, closely worted, bark ash coloured peeling off in flacks, shoots glabrous [3,12]. The leaves are simple, entire, alternate, extipulate, 3.8-6.4 cm long roundish ovate broadly cordate, acute or acuminate glabrous, thin, 5-7 nerved with petiole 2.5-5 cm long slender, thickened and curved at base. Flowers greenish yellow, regular, unisexual appears in February, with male flowers clustering in the axils of small subulate bracts, while the female flowers are usually solitary. Sepals are 6, inner sepals much longer. Petal 6, shorter than inner sepals. Male flowers: stamen 6, distinct, filaments thickened upwards and adnate to base of petals and wrapped in the female flowers: stamens reduced to small scales, ovary superior, 3 carpellary, carpels distinct on a thick gynophore, styles short, stigma dilated, tongue shaped and laciniate, ripe carpels 1-3 ovoid, apiculate and smooth. [12] The fruit is orange red in color, drupe shaped and appear in the winter season [10]. Its taste is bitter. Seeds are curved and pea shaped. Wood is porous soft and white in color. [3]

### Taxonomical Classification[14]

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Ranales
Family:	Menispermaceae
Genus:	<i>Tinospora</i>
Species:	<i>Cordifolia</i>

### Description in Unani Literature

Gilo is a climbing herb which demands support for its growth from walls and trees like Neem and is named accordingly e.g. Gilo growing on neem tree is called *Gilo-i-Neem* or *Neem Gurich* and it considered better in quality. Due to its parasitic nature it is called as a parasitic plant also. The bark of the stem is rough and muddy in colour, after removing the bark the stem appears green, while flowers are yellow and fruits are red in colour. Its leaves are heart shaped, resembles with the leaves of Paan (*Piper betel*). All the parts of the plant are bitter in taste. In Ayurvedic system of medicine Gilo is said to form from *Amrit* so named as *Amrita* or *Amritlata* in Sanskrit [6,15,16]. The starch is obtained from the leaves and stem is known as *Sat-i-Gilo*. [16]. The whole plant as well as its different parts such as stem, root, bark, fruit and leaf are being used in Unani System of medicine. [9] Mainly the dried pieces of stem and starch known as *Sat-i-Gilo* is available in the market which are being used in Unani System of Medicine for the treatment of various ailments [17]. The stem is better to use before one year of collection,[16] it can be used in fresh form also [4] (See Fig.).



**Fig. showing Gilo (*Tinospora cordifolia*) climbing on the wall (a & b); pieces of stem with mud colour bark (c); green colour stem after removing the bark (d); red colour fruits (e); cut pieces of stem with specific wheel like appearance (f)**

**Mutardifat (vernacular names)**

Assamese:	Amralata, Siddhilate [4]
Bengali:	Gadancha, Gilo, Gulancha, Ningilo [4]
Burma:	Sinomone, Sinzamanne
English:	Gulancha, Indian tinospora or Heart leaf moonseed, Moon creeper [3,4,17], Heavenly elixir [14]
Gujrati:	Gulbel, [16] Galac, Garo, Gado, Galo, Gulo, Gulwel [4]
Hindi:	Giloe, Gulancha, Gulvel, Gurcha, Gurach, Amrita [1,4,6]
Kannada:	Amrutballi, Amrulballi [4]
Kashmiri:	Amrita, Gilo [3,4]
Malayalam:	Amritu, Piyamritam, Sittamritu [4]
Marathi:	Gulvel, Ambarvel, Gharol, Giroli, Guloe [4]
Oriya:	Guluchi, Gulochi [4]
Panjabi:	Batindu, Garham, Garun, Gilo, Gularish [4]
Persian:	Gulbel [4]
Sanskrit:	Amritavalli, Amrita, Amritlata, Guduuchi, Guluuchi, Guruchi [2,3,6]
Sikkim:	Gurjo
Sinhale:	Galuchi, Rasakinda [12]
Sindhi:	Sat Gilo
Tamil:	Amudam, Amridavalli Asasi, Sindil, Sindilkodi, Kunali, Sadi, [12]
Telugu:	Guduchi, Madhuka, Manpala, Somida Thippateega [4]
Unani:	Gilo, Gulanchaa, Sat-e-Gilo [2]
Urdu:	Gilo [4]

**Mizaj (temperament)**

There is a huge controversy regarding the temperament of Gilo as some Unani Physicians mentioned its temperament as hot and dry in 1<sup>st</sup> degree, [18] while others as hot and moist in 1<sup>st</sup> degree but Hakim Sharif Khan has written it as *Murakkabul Quwa* and according to Hakim Abdul Hakim, *Atibba-i-Hind* mentioned the temperament as cold and dry [6,15].

**Af'al (actions):**

It has *Dafi'-i-Hummā balghami wa Safrāwi* (anti phlegmatic and bilious fever), *Dafi' Tap-i-Larza* (shivering fever), *Muṣaffī-i-Dam* (blood purifier), *Muḥallil-i-Awarām* (anti-inflammatory), *Mushtahī* (appetizer), *Kāsir-i-Riyāḥ*

(carminative), *Musakkin-i-Alam* (analgesic), *Dāfi'-i-Su'āl* (antitussive), *Muqawwi-ī-Mi'da* (stomachic), *Muqawwī-i-Bāh* (aphrodisiac), *Qābiḍ* (astringent), *Mu'addil* (moderator), *Mudirr-i-Bawl* (diuretic), *Muwallid-i-Mani* (spermatogenic), *Qāṭi'-i-Balgham*, *Dāfi'-i-Ātashak* (anti-syphilitic), *Dāfi'-i-Sozāk* (Gonorrhoea), *Qatil-i-Kirm Shikam* (anthelmintic), *Muwallid-i-Manī* (spermatogogue), *Mudirr-i-Ḥayḍ* (emmenagogue), *Nafi'Dhayabitus* (antidiabetic), *Dāfi'-i-Tashannuj* (antispasmodic), *Mukhrij-i-Dīdān-i-Am'ā* (vermifuge), *Mufattiḥ-i-Sudad* (deobstruent) properties [6,15,17].

**Iste'malat (Uses):**

*Tinospora cordifolia* is used in *Tap-i-Damwi* (sanguineous fever), *Tap-i-Safrāwi* (bilious fevers), *Tap-i-Muzmina* (chronic fever), *Humma-i-Diq* (tuberculosis), *Su'āl* (cough), *Humma-i-Muharriqa*, *Yaraqan* (jaundice), *Ḥarārat-i-Jigar* (hotness of Liver), *Waram-i-Jigar* (hepatitis), *Waram-i-Tihal* (splenomegaly), *Ḍu'f al-Ishtihā'* (anorexia), *Su-i-Hadm* (dyspepsia), *Khafaqan* (palpitation), *Junūn* (mania), *Alam* (pain), *Bawasir* (haemorrhoids), *Ghashī* (syncope), *Ātashak* (syphilis), *Sozāk* (gonorrhoea), *Dhayabitus* (Diabetes mellitus), *Faqrud Dam* (anemia), *Ishāl* (diarrhea), *Su'āl* (cough), *Ihtibas-i-Bawl* (dysuria), *Da' al-feel* (elephantiasis), Snake bite, Leucorrhoea, Spermatorrhoea, Rheumatoid arthritis, general debility, cardiac and skin diseases etc. [6,9, 13,15,17].

**Mazarrat (toxicity and adverse effects)**

It is harmful for tendons and the person having hot temperament. Due to the bitter taste it causes emesis. [6,18].

**Muslehāt (correctives)**

*Tabasheer* (bamboo manna) and *Dana Heel Kalan* and honey are used to counter its adverse and side effects (*Amomum subulatum*) [6,18].

**Badal (Substitute or Alternative)**

*Satt-e-Gilo* (starch from the leaves and stem) is mentioned as substitute of the drug. [6].

**Miqdar-i-Khurak (Dosage)**

In classical literature the dosage of Gilo is 4-9 or 10g per day orally. [4,15]. For decoction or infusion 1-2 tola (12-24 gm) can be used and *Ab-i-Gilo* is 2-3 tola (24-36 gm) [6]; Stem- 3-6 g (as powder) [2].

**Tarkeeb-i-Iste'mālāt (method of administration):**

The mode of administration of this drug for the treatment of various diseases are as follows:

**Amrad-i-Ain (eye diseases):** The extract obtained from the plant is used to wash the eyes for removing foreign substances.

**Amrad-i-Qalb (cardiac diseases):** *Joshānda* (decoction) of this drug with Brahmi (*Bacopa monnieri* (Linn.)) is useful to treat *Khafaqān* (palpitation). Gilo is used with *Misrī* (sugar) to reduce *Hiddat-i-Safra* and along with honey to reduce *Galba-i-Balgham* [13].

**Amrad-i-Nizam-i-Hadm (diseases of GIT):** Due to its astringent property, it is used in dysentery and chronic and bleeding diarrhea. [6] The powder of Gilo (*T. cordifolia*) and Sonth (*Zingiber officinale*) is used as snuff to cure hiccup.[15] Due to its bitter test it expels the intestinal worms.[6].

**Amrad-i-Nizam-i-Bawl wa Tanasul (Diseases of urogenital system):**

Due to the *Musaffi-i-Khoon* (blood purifying) property it is used to treat *Sozāk* (gonorrhoea) and *Ātashak*. (Syphilis) [6] It is used alone as well as in compound formulation to treat *Jarayan* (spermatorrhoea) [6].

**Amrad-i-Niswan (gynecological disorders):** It is used with *Satawar* (*Asparagus racemosus*) for the treatment of leucorrhoea.

**Amrad-i-Jild (skin diseases):** Due to its *Musaffi-i-Khoon* property, uses of Gilo is very effective for skin diseases [6].

**Hummiyāt (fever):** The decoction and infusion of the plant is used to cure tuberculosis and chronic fevers. The extract obtained from the fresh plant is more effective in this regard. [6] Taking *Satt-e-Gilo* 1 gm with *Tabasheer* 1gm is also effective fever with chills. [17, 19].

**Da' al-Feel (Elephantiasis):** It is used along with Sonth (*Zingiber officinalis*) in elephantiasis [15].

**Ethanomedicinal uses:** *T. cordifolia* has been documented as potential medicinal plant in the history of traditional medicines. It has many useful features. Its roots have anti-malarial and stress relieving activities. Stem is used to cure jaundice as it stimulates the secretion of bile. It has been used in folk medicine in different regions of world. Some important uses are discussed as below:

The pills made from *T. cordifolia* are used in the treatment of fever from ancient times. Stem, decoction, bark and powdered roots of *T. cordifolia* are used to cure cancer. [3] Powdered root is consumed 1 table spoon twice a day to cure breathing problems, piles and ulcers [20]. Decoction of the roots is used in the treatment of diarrhea and dysentery. Leaf paste of *T. cordifolia* is used to cure burn injury [3]. It is given with milk to cure rheumatism, dyspepsia and burning micturition [21]. It is used to cure gastrointestinal ailments such as gastritis, jaundice, hemorrhoids and diarrhea. It plays important role in the treatment of various metabolic disorders including kidney diseases and diabetes. It is also used to cure urinary disorders, skin diseases and eye infections [3]. In Gujrat wearing a neckless known as *Kamla ni Mala* (jaundice neckless), made up of small pieces of stem is supposed to cure jaundice [21]. The Mundas of Chota Nagpur are used to apply the paste on fracture. [22]. In Cuddlore district of Tamilnadu, India, dried leaves powder mixed with hot water is taken orally for the treatment of Diabetes [23]. By the local women of Rajasthan a paste prepared with *T. cordifolia* and *Piper nigrum* is taken orally once daily for the treatment of leucorrhoea [24].

**Murakkabat (compound preparations):** Compound formulations having Gilo as one of the ingredients are mentioned in table 01 with their dosage and indications.

**Table 1: Showing compound having Gilo as one of the main ingredients with their dosage and indication.**

Sr. No.	Name of Compound Formulations	Parts used	Dose and method of administration	Indications
01	Arq Gilo [25]	Gilo Sabz	Oral	Fever
02	Arq Hara Bhara	Gilo Sabz	Oral; 6 tola (720 ml)	Tuberculosis, gonorrhoea, in the form of liquid palpitation and burning micturition (UTI)
03	Arq Maul Lahm Mako Kasniwala [26, 27]	Gilo Sabz	Oral; 125 ml in the morning; in the form of liquid	Inflammatory condition of visceral organs, like stomach, liver etc
04	Habb-i-Iksir Bukhar [25]	Satt-i-Gilo	Oral; 400 mg in the form of pills, thrice a day with lukewarm water	Seasonal fever and chills and rigor
05	Habb-i-Sozāk Had [28]	Satt-i-Gilo	Oral; 1.5 to 3 g in the form of pills	Gonorrhoea and burning micturition (UTI)



06	Habb-i-Sozāk Muzmin [28]	Satt-i-Gilo	Oral; 3 g in the form of pills	Due to its antimicrobial property it is useful in Gonorrhoea and burning micturition (UTI)
07	Nawjivan Ghutti [25]	Gilo Sabz	Oral; 5 drops with mother's milk or water twice a day (for up to 3 month children); 10 drops with mother's milk or water twice a day (3-6 month children); In case of constipation the dose can be increased and given with warm water.	Cold, coryza, cough, diarrhea, vomiting, constipation etc.
08	Qurs Bukhar[25]	Satt-i-Gilo	Oral; 2 tablets twice a day	Fever
09	Qurs Fizza [27]	Satt-i-Gilo	Oral; One tablet (260 mg)	Cardiac weakness, palpitation and cerebral weakness
10	Qurs Hawamil [27]	Satt-i-Gilo	Oral; One tablet (775 mg) twice a day	In pregnancy for nausea and vomiting
11	Sufuf Kushta Qala'i [26, 29]	Satt-i-Gilo	Oral; 9-12g powder with warm water	Spermatorrhea, gonorrhoea
12	Satt-e Gilo leaves and stem	Starch obtained from	Oral;	Fever
13	Sufuf Satt-i-Gilo [4]	Satt-i-Gilo	Oral	Fever
14	Sufuf Satt-i-Gilo Sartani [4]	Satt-i-Gilo	Oral	Tuberculosis
15	Safuf Sat Gilo Salajit [26]	Satt-i-Gilo	Oral; 3-9g with milk or cold water	Gonorrhoea and spermatorrhoea

## SCIENTIFIC STUDIES

### Phytochemistry

Plant is mainly composed of steroids, glycosides, sesquiterpenes, polysaccharides, fats, essential oil, and aliphatic compounds. The key active phytoconstituents include tinosporaside, tinosporine, cordifolide, heptacosanol, columbin, choline, tinosporide, clerodane furano diterpene, tembertarine, palmatine, magniflorine,  $\beta$ -sitosterol, cordifol, diterpenoid furano lactone, and Berberine. Recent investigations resulted in isolation of four new compounds from methanolic extracts of *T. cordifolia*. These include alkaloids (tinoscorside A and tinoscorside B), a clerodane diterpene (tinoscorside C), and a phenylpropanoid (tinoscorside D) [13]. Nutritional value of plant is very high as it is rich in dietary fibers and proteins, carbohydrates and fats. In addition to this, appreciable amounts of essential minerals (Co, Sr, Zn, Cl, K, Ca, Fe, Br, Ni, Ti, and Cr) are also present. [3] The drug is reported to possess one- fifth of the analgesic effect of sodium salicylate. Its aqueous extract has a high phagocytic index [1,2]. Various

chemical constituents which have been found in different parts of the herb are as (table 02):

### Pharmacological studies

**Immunomodulatory activity:** According to an *in vivo* study done by Aher et al. (2010), an enhancement in the bone marrow cellularity as well as  $\alpha$ -esterase activity was observed when the rats were treated with alcoholic extracts of *Tinospora cordifolia*. It gives evident that *T. cordifolia* has immunomodulatory effect on rats. [30] According to a study performed by Kalika et al. (2008), using an HIV positive volunteer group revealed the considerable effect of the immunostimulation in the *Tinospora cordifolia* stem extract. In result the treated group showed a significant reduction of Leukocytes and Eosinophil count compare to the control. This study supports the immunomodulatory effect of the plant *Tinospora cordifolia* [31].

### Anti-inflammatory and Antipyretic activities:

Aqueous extract of stem of *T. cordifolia* in graded doses (1.25g/kg, 2.5g/kg and 5gm/kg) was used to evaluate anti-

**Table 1: Showing compound having Gilo as one of the main ingredients with their dosage and indication.**

S. No	Parts of the plant	Phytochemicals present
1	Stem	Alkaloids and terpenoids [4] Berberine, Palmatine, 18-norclerodane glucoside, Furanoid diterpene glucoside, Cordifolisides A to E. [9]
2	Bark	Berberine, Palmatine, 18-norclerodane glucoside, Furanoid diterpene glucoside, Cordifolisides A to E, Palmatosides C and F, Cordioside. [9]
3	Whole Plants	Furanolactone, Clerodanederivatives and Tinosporon, Tinosporides, Jateorine, Columbin, Octacosanol, Cordifol. [9]
4	Roots	Jatrorrhizine, Tetrahydropalmatine, Isocolumbin, Palmatine, Magnoflorine, Tembetarine.[9]

inflammatory activity by carrageenan and histamine induced rat paw edema and anti-pyretic activity by Brewer's yeast induced pyrexia in albino rats. In result significant anti-inflammatory and anti-pyretic activities were observed in comparison to diclofenac sodium and paracetamol respectively. This activity may be attributed to the presence of various phytoconstituents present in extract of *T. cordifolia* [32]

**Antimicrobial activities:** The anti-microbial nature of the plant extracts (ethanolic, methanolic and aqueous extracts of the leaf) against *E. coli* were tested by Kumar et al. (2017) using slip disc method. The degree of antimicrobial character of the plant extracts was inferred by the comparative studies of the zone of inhibition (in mm diameter). The results shown after research proved that the natural medicinal character of the climber is an economical alternative form of medicine compared to the currently used conventional medicines. [33]

**Antidiabetic and Anti-hyperlipidemic effect:** The antihyperlipidemic effect of aqueous extract of stem of *Tinospora cordifolia* was observed in diet induced hyperlipidemia and streptozosin induced *D. mellitus* in rats. Aqueous extract of *T. cordifolia* at the dose of 200 mg/kg b.w. decreased serum glucose, cholesterol, triglycerides, creatine kinase, and free fatty acids to normal level when compared to that of standard drug. The study shown the potential effect in controlling the diabetes associated hyperlipidemic conditions.[34]

**Hepatoprotective effect:** Hepatoprotective effect aqueous extract of *T. cordifolia* in Albino Wistar rats was observed against carbon tetrachloride (CCl<sub>4</sub>) induced hepatotoxicity. In result, a reduction in ALT, ALP & Total bilirubin levels were found. This hepatoprotection was also reflected in histologic changes. This result may occurs due to the antioxidant and/or free radical scavenger property and ability to induce hepatic regeneration. [35]

**Antidiarrheal effect:** The starch from roots and stem, used in chronic diarrhea and dysentery contains a polysaccharide having 1-4 glucan with occasional branching points.[1]

In addition to above mentioned activities, the different extracts of various parts of Gilo showed significant anti-spasmodic, anti-ulcer, anti-scabies, cardio protective, activities in various studies [9].

### CONCLUSION

Gilo or *Tinospora cordifolia* is an incredible medicinal plant and a part of Unani and Ayurvedic System of medicine. It shows analgesic, antipyretic, anti-inflammatory, diuretic, aphrodisiac, anti-bacterial, anti-viral, anti-oxidant properties and has a well-documented role of treating various diseases like fever, diabetes, gonorrhoea, syphilis, piles, jaundice, rheumatoid arthritis, gout, to name a few. An extensive research is being carried on its immunomodulatory activity and it has shown a promising effect in this regard. Since Gilo is a storehouse of various phytochemicals, further research is needed to explore its new therapeutic activities.

### ACKNOWLEDGEMENT

Authors are highly thankful to the Assistant Director in charge Dr. Seema Akbar, RRIUM, Srinagar for providing such type of research environment in the institute and librarian for providing books and literatures regarding the topic. We are also thankful to all the editors and authors of the books and journals from where the material for this paper was consulted, discussed and used herein.

### REFERENCES

1. **Kokate Kokate**, Purohit, Gokhale: Textbook of Pharmacognosy, 43<sup>rd</sup> edition, Nirali Prakashan, 2012, 101-103.
2. **Khare CP**. Indian Medicinal Plants: An Illustrated Dictionary, 1st Ed. Springer Pvt. Ltd. New Delhi 2007; Pp-662-663.
3. **Arshad S, Rehman R, Mushtaq A, Rafiq M and Azeem M.W**. Heartleaf Moonseed: A phytopharmacological review. *International Journal of Chemical and Biochemical Sciences*. 2018; 14: 115-119.
4. **Anonymous**. The Unani Pharmacopoeia of India. Part 1, Vol-01. Central Council for Research in Unani Medicine. New Delhi 2007; Pp- 30, 31.

5. **Narkhede AN, Jagtap S, Kasote DM, Kulkarni O.** Comparative immunomodulation potential of *Tinospora cordifolia* (Willd.) Miers ex Hook. F., *Tinospora sinensis* (Lour.) Merrill and *Tinospora cordifolia* growing on *Azadirachta indicica* A. Juss. *Indian Journal of Experimental Biology*. 2014;52: 808-813.
6. **Kabiruddin M.** Makhzun al-Mufaradat. Idara Kitab us Shifa; New Delhi 2014, Pp- 354, 355.
7. **More P and Pai K.** Immunomodulatory effects of *Tinospora cordifolia* (Guduchi) on macrophage activation. *Biology and Medicine* 2011; 13(2):134-140.
8. **Kapil A and Sharma S.** Immunopotentiating compounds from *Tinospora cordifolia*. *J Ethnopharm* 1997; 58(8): 89-95.
9. **Ahmad N, Nawab M, Qamaruddin.** Medicinal Properties of Gilo (*Tinospora cordifolia*)-A Review. *World Journal of Pharmacy and Pharmaceutical Sciences* 2019; 08 (8): 430-436.
10. **Kattupalli S, Vesta V, Vnagara S, Spandana U.** The multi-activity herbaceous vine *Tinospora cordifolia*. *Asian Journal of Pharmaceutical and Clinical Research*. 2019; 12(3): 1-4.
11. **Mittal J, Sharma MM, Batra A.** *Tinospora cordifolia*: a multipurpose medicinal plant-A review. *Journal of Medicinal plant studies*. 2014; 2(2): 32-47.
12. **Jayaweera DMA.** Medicinal Plants (endogenous and exotic) used in Ceylon. The National Science Foundation of Srilanka, Colombo 1981, Pp 80,81.
13. **Abdul Hakim.** Bustanul Mufradat. Aijaz Publishing House 2011, P 279
14. **Khan M, Haque M. S, Chowdhury M.S.** Medicinal use of the unique plant *Tinospora cordifolia*: evidence from the traditional medicine and recent research. *Asian journal of Medical and Biological Research*. 2016; 2(4):508-512.
15. **Ghani N.** Khazain al-Advia, Idara Kitab al-Shifa; New Delhi 2011, Pp-1138-1139.
16. **Rafiquddin Hakim.** Kanzul Advia Mufrada. University Publication Unit, AMU 1985, Pp 594-596.
17. **Safiuddin Ali.** Unani Advia Mufarada. Qaumi Council Bara-e-Farog-i-Urdu Zaban, New Delhi 2010; p 243.
18. **Abdul Haleem.** Mufradat Azizi. Central Council for Research in Unani Medicine; New Delhi 2009, pp 103.
19. **Ashraf H.** Makhzanul Mufaradat Ma Murakkabat wa Khawasul Advia. Aijaz Publishing House 2011, p 210.
20. **Trivedi PC.** Medicinal plant conservation and utilization Avishkar Publisher and Distributors. Jaipur 2004, 422.
21. **Chopra RN, Chopra IC, Handa KL, Kapur LC.** Indigenous drugs of India. 2<sup>nd</sup> edn. Dhur and Sons pvt ltd. Culcutta 1958, 236-238, 426, 428.
22. **Kirtikar KR and Basu BD.** Indian Medicinal Plant. International Book Distributors Dehradun 2012.
23. **Kavya B, Kavya N, Ramarao V and Venkateshvarlu G.** *Tinospora cordifolia* (Willd.) Meirs. Nutritional, ethanomedical and therapeutic utility. *International Jour al of Research in Ayurveda and Pharmacy*. 2015; 6(2): 195-198.
24. **Joshi G and Kaur R.** *Tinospora cordifolia*: a pharmacological review. *International Journal of Pharmaceutical Science and Research*. 2016; 7(3): 890-897.
25. **Anonymous.** National Formulary of Unani Medicine. Part 6<sup>th</sup>. Central Council for Research in Unani Medicine; New Delhi 2011; Pp- 15, 31,122-123.
26. **Kabiruddin M.** Bayaz-i-Kabeer. Vol-2. Idara Kitab us Shifa. New Delhi 1935,Pp 72, 103, 105, 159.
27. **Anonymous.** National Formulary of Unani Medicine. Part 5<sup>th</sup>.Central Council for Research in Unani Medicine. New Delhi2008,Pp 21-22, 23,137.
28. **Anonymous.** National Formulary of Unani Medicine. Part 2<sup>nd</sup>. Central Council for Research in Unani Medicine. New Delhi 2007, Pp- 26, 148.
29. **Usmani MI.** Tanqeehul Mufradat. Famous Offset press, Delhi 2008, Pp 75-76
30. **Aher VD, Wahi A.** Pharmacological study of *Tinospora cordifolia* as an immunomodulatory: *International Journal of Current Pharmaceutical Research*. 2010; 2(4): 52-4.
31. **Kalika MV, Thawani VR, Varadpanda UK, Sontakke SD, Singh RP, Khiyani RK.** (Immunomodulatory effect of *Tinospora cordifolia* extract in human immunodeficiency virus positive patients). *Ind J Pharma*. 2008; 40(3): 107-110.
32. **Sumanlata, Akanksha Suman, Rajeev Kumar Sharma, Adnan Khan.** Evaluation of Anti-Inflammatory and Antipyretic Effect of Aqueous Extract of *Tinospora Cordifolia* in Rats. *International Journal of Research & Review* 2019. 6(8): 340-47.
33. **Dinesh Kumar V, Geethanjali B, Avinash KO, Kumar JR, Chandrashekrappa GK, Kanthesh M.**

- Basalingappa1.** *Tinospora cordifolia*: the antimicrobial property of the leaves of amruthaballi. *J Bacteriol Mycol* 2017;5(5):363–371
34. **Nagaraja PK, Kammar KF, and Devi S.** Efficacy of *Tinospora cordifolia* (Willd.) extracts on blood lipid profile in streptozotocin diabetic rats: Is it beneficial to the heart: *Biomedical Research* 2008; 19(2): 92-6.
35. **Kumar V, Pankaj K Modi, Saxena KK.** Exploration of hepatoprotective activity of aqueous extract of *tinospora cordifolia* - an experimental study. *Asian Journal of Pharmaceutical and Clinical Research*. 6(1): 2013, 87-91.