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## RESEARCH ARTICLE

### GILOY- A REVIEW

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India

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#### ABSTRACT

*Tinospora cordifolia* is significant therapeutic plant, from the family Menispermaceae, acting as one of the primary source of new drugs and medical care items. The whole plant possesses bioactive properties and is being used from past many decades as folk medication as well as Ayurvedic medication for the treatment of various ailments. Therefore, this plant is also called as Amruta which means nectar because of its divine healing properties.

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## INTRODUCTION

Plants are being utilized as wellspring of medications since ages. Numerous restorative plants are nature's blessing to us to shape illness free stable life. These plants are broadly utilized as ethno medicine around the world. *Tinospora cordifolia* is one of the most significant plants utilized in indigenous system of medication. There are endless references of its uses in customary medication. The entire plant is utilized in folk and the Ayurvedic arrangement of medication alone and in combination with other plants. This plant is commonly known as Amrita or Guduchi. Amrit means nectar of God therefore this plant is also considered as the plant of immortality. *T. cordifolia* is a helpful restorative plant; it has good impact on wellbeing, prolong life, upgrades memory, and improves the nature of voice and fertility and have therapeutic properties including cancer prevention agents, antimicrobial, against diabetic, hostile to maturing. The antimicrobial properties and cytotoxic action of *T. cordifolia* has been assessed in its unrefined methanolic extract, Petroleum ether, carbon tetrachloride, and chloroform extract.

## Morphology

It is a huge deciduous, widely spreading climbing bush with a few curled branches with an alternate sort of morphology.

The stem of the plant is filiform, beefy and moving in nature; bark is white to grey. Powder of the stem is creamish earthy colored or dim earthy colored, trademark scent, unpleasant taste. The starch acquired from the stem known as "Guduchi-satva". Leaves of this plant are straightforward, substitute, long-petioled (around 15 cm); round, pulvinate, heart-molded, wound somewhat and most of the way around. Lamina is praise, 10–20 cm long, seven nerved and profoundly cordate at the base and membranous. Flowers are unisexual, axillary position, 2–9 cm long handout branches and greenish-yellow in shading, male flowers are bunched, female flowers are mostly solitary. The root is string like, arial, squarishin, constantly touches the ground, aeronautical roots are described by tetra to penta curve essential structure. The seeds are bended shape, and endocarp is differently ornamented, which gives basic ordered characters.

## Species of *Tinospora*

Out of 40 species found all over the tropical areas like Africa, South East Asia, Indo Malaya, Australia, 3 species have been recovered from India.

- ) *Tinospora cordifolia*.
- ) *Tinospora sinensis*
- ) *Tinospora crispa*

Some other species: *Tinosporabakis* Miers,  
*Tinosporarumphii* Boerl, *T. malabarika* Miers.

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## Taxonomy of Giloy

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Ranunculales

Family: Menispermaceae

Genus: *Tinospora* fig. 1 Giloy

Species: *T. cordifolia*

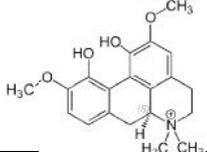
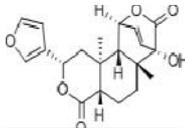
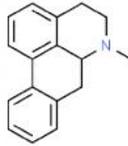
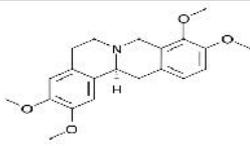
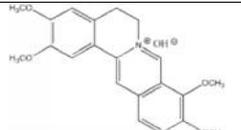
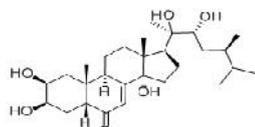
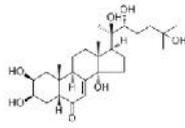
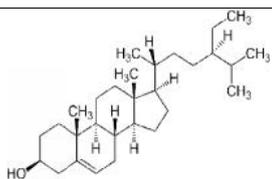
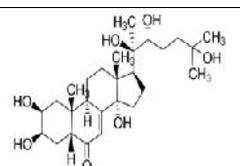
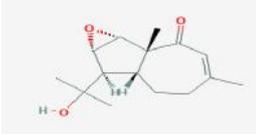
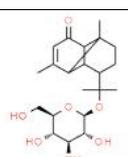
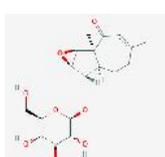


Vernacular Name		
1.	Hindi	Gurcha , Giloy, Gulancha, Guloh, Gulneha , Amrita
2.	English	Heart leaf moonseed, Bile killer, Indian tinospora, Moon creeper
3.	Sanskrit	Guduchika, Jivantika , Vatsahani , Amritha druma
4.	Urdu	Abb-e Hyat , Gurch, Gulucha
5.	Arab	Gilo
6.	Bangali	Gulancha, Golancha , Giloe
7.	Marathi	Gulvel
8.	Kannada	Amrutha balli , Amaradadalli , Agni balli
9.	Gujrati	Garo, Galac
10.	Telgu	Thippateega , Dussiramu
11.	Tamil	Silam , Kunali , Seendil Kodi , Chindil , Seendal , Amrutvalli
12.	Punjabi	Gilo, Gilo gulanch
13.	Malyalam	Chittamrutu, Amrtu
14.	Kashmiri	Gilo, Amrita
15.	Oriya	Guluchi , Gulancha
16.	Manipuri	Ningthou khonjli
17.	Assam	Siddhilata , Shaguni-lata , Hoguni-lot , Amar- lata , Gelo

Classical Names
Gudhuchi, Madhuparni, Amrita, Amritavallari, Chhinna, Chhinaruha, Chinnodbhava, Vatasadani, Tantrika, Kundalini, Chakralakshnika , Somavali , Dhira , Vishalya , Rasayani , Chandrahasa, Vayastha , Mandali , Devanirmita

Chemical constituent	Class	Property	Structure
1. Berberine	Alkaloid	Neuroprotective, Antiviral, Anti-cancer, Anti-inflammtory, Anti-diabetic, Immuno-modulatory, Aphrodisiac property	
2. Tinosporin	Alkaloid	Neuroprotective, Aphrodisiac property, Ameliorative effect, Cardioprotective effect, Antiviral, Anti-cancer, Anti-inflammtory.	
3. Cholin	Alkaloid	Neuroprotective, Antiviral, Anti-cancer, Anti-inflammtory, Anti-diabetic, Immuno- modulatory.	
4. Tambetarin	Alkaloid	Neuroprotective, Antiviral, Anti-cancer, Anti-inflammtory, Anti-diabetic, Immuno- modulatory.	
5. Jatrorrhizine	Alkaloid	Neuroprotective Antiviral, Anti-cancer, Anti-inflammtory, Anti-diabetic, Immuno- modulatory.	

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Mangnoflorine	Alkaloid	Anticancer, Hepatoprotective activity.	
Isocolumbin	Alkaloid	Antiviral, anti-cancer, anti-diabetic, anti-inflammatory, immunomodulatory	
Aporphine	Alkaloid	Antiviral, anti-cancer, anti-diabetic, anti-inflammatory, immunomodulatory	
Tetrahydropalmatine	Alkaloid	Antiviral, anti-cancer, anti-diabetic, anti-inflammatory, immunomodulatory	
Palmetin	Alkaloid	Antiviral, anti-cancer, anti-diabetic, anti-inflammatory, immunomodulatory	
Makisterone	Steroid	Glucocorticoid initiated osteoporosis early inflammatory joint pain.	
Ecdysterone	Steroid	Glucocorticoid initiated osteoporosis early inflammatory joint pain.	
-sitosterol	Steroid	Glucocorticoid initiated osteoporosis early inflammatory joint pain. Actuate cell cycle capture in G2/M stage and apoptosis through c-Myc concealment	
20 -hydroxyecdysone	Steroid	Glucocorticoid initiated osteoporosis early inflammatory joint pain.	
Tinocordifolin	Sesquiterpenoid	Antiseptic	
Tinocordiside	Glycoside	Treats dementia, motor and cognitive deficits and neuron loss in spine and hypothalamus. immunomodulator	
6. Tinocordifolioside	Glycoside	Treats dementia, motor and cognitive deficits and neuron loss in spine and hypothalamus. immunomodulator	

Continue..

Chemical constituent	Class	Property	Structure
1.Furanolactone	Diterpenoid Lactones	Vasorelaxant: relaxes norepinephrine induced contractions, inhibits calcium ion influx,anti-inflammatory, antimicrobial, antiviral	
2.Clerodane 3.derivatives	Diterpenoid Lactones	Vasorelaxant: relaxes norepinephrine induced contractions, inhibits calcium ion influx,anti-inflammatory, antimicrobial, antiviral	
4.Tinosporin	Alkaloid	Neuroprotective, Aphrodisiac property, Ameliorative effect, Cardioprotective effect, Antiviral, Anti-cancer, Anti-inflammatory.	
5.Columbin	Diterpenoid Lactones	Anti-inflammatory, antimicrobial, antiviral.	
6.Octacosanol	Aliphatic compound	Anti-nociceptive, Anti-inflammatory	
7.Jatrorrhizine	Other	Protease inhibitor for HIV, drug resistant HIV.	

Chemical constituent	Class	Property	Structure
1.Tetrahydropalmatine	Alkaloid	Anti-viral infections, Anticancer, anti-diabetes, inflammation, Neurological, immunomodulatory, psychiatric conditions	
2.Aporphine	Alkaloid	Anti-viral infections, Anticancer, anti-diabetes, inflammation, Neurological, immunomodulatory, psychiatric conditions	
3.Palmetin	Alkaloid	Antiviral, anti-cancer, anti-diabetic, antiinflammmtory, immunomodulatory	
4.Tambetarin	Alkaloid	Antiviral, anti-cancer, anti-diabetic, antiinflammmtory, immunomodulatory	
5.Cholin	Alkaloid	Neuroprotective, Antiviral, Anti-cancer, Anti-inflammatory, Anti-diabetic, Immuno- modulatory.	
6.3,(a,4-di hydroxy-3-7-methoxy-benzyl)-4-8,(4- compounds hydroxy-3-9-methoxy-benzyl)- tetrahydrofuran,	Other	Protease inhibitors for HIV and drug resistant HIV.	
10.N-transferulolytyramine as diacetate	Other	Protease inhibitors for HIV and drug resistant HIV.	

Hindi/ Sanskrit	
Virya	Ushana
Vipaka	Madhura
Guna	Guru, Sandigdhd
Rasa	Tikta , Kashaya

English	
Potency	Hot Potency
Metabolic Property	Sweet
Physical Property	Heavy and oily
Taste	Bitter, Astringent

Product Name	Properties	Product picture
Tinospora Cordifolia Pellets	used in a number of diseases	
Brave Heart Capsule	It lowers the lipid levels especially cholesterol and LDL	
Cirrholiv-ds syrup	Hepatoprotective	
Mussaffen	Blood purifier and anti-allergic	

Use of Giloy in various	
1. Anti-diabetic Activity	The extracts from the stem is effective against blood sugar level. It has been reported to act as anti-diabetic drug through explanatory oxidative stress, promoting insulin secretion by inhibiting gluconeogenesis and glycogenesis.
2. Immunomodulatory Activities	Giloy plant is well known for its immunomodulatory activity. A number of compounds which are responsible for immunomodulatory and cytotoxic effects i.e. 11- hydroxymuskatone, N-methyle-2-pyrrolidone, Nformylannonain, cordifolioside A, magnoflorine, tinocordioside and syringing.
3. Anti-toxic Activities	The leaf and stem extract of Giloy ( <i>T. cordifolia</i> ) has been reported to show hepatoprotective effect. The Oral dose of plant extract is used for protect the liver damage from lead nitrate.
4. Anti-HIV Activities	The plant has been shown resistance against HIV. The root extract reduced in eosinophil count, stimulation of B lymphocytes, macrophages, level of hemoglobin which shows the anti-HIV property.
5. Anti-Cancer Activities	The main principles of Giloy is to enhance host immune system by increasing immunoglobulin and blood leukocyte levels and by the stimulation of stem cell proliferation.
6. Anti-Microbial Activities	The microbial infection is treated with the Methanolic extract of the plant . Antibacterial activity of <i>T. cordifolia</i> is used against various microbes i.e <i>Escherichia coli</i> , <i>Staphylococcus aureus</i> , <i>Klebsiella pneumonia</i> , <i>Proteus vulgaris</i> , <i>Salmonella typhi</i> , <i>Shigella flexneri</i> , <i>Salmonella paratyphi</i> , <i>Salmonella typhimurium</i> , <i>Pseudomonas aeruginosa</i> , <i>Enterobacter aeruginosa</i> , <i>Enterobacter aerogene</i>
7. Anti-Oxidant Activities	The anti-oxidant activity held in the methanolic extract of the stem by increasing the erythrocytes membrane lipid peroxide and catalase activity
8. Anti Allergic Activity	Giloy Plant also shows anti-allergic activity by provided significant relief from sneezing, nasal discharge, nasal obstruction, and nasal pruritus.
9. Antiulcer Activity	In a scientific study it is observed that the antiulcer activity by using the ethanolic extracts of the roots of <i>T. cordifolia</i> , induces a marked protective action against an ulceration,
10. Wound Healing Activity	The plant also possess healing property which was noticed by the reduction in the period of epithelialization, increase in collagen deposition and increase in tensile strength in granulation tissue.

11.Mental Disorder	Traditionally, the whole plant and the juice of the leaves are used in various mental disorders. This is regarded as one of the best psychotropic drugs in India
12.Effect on Memory	Both the alcoholic and aqueous extracts of <i>T. cordifolia</i> is used for produced retention memory, indicating enhancement of learning and memory.
13.Against Dengue	In Ayurveda the capsule developed from giloy is useful in the treatment of Dengue.
14.Antipyretic Activity	The hexane and chloroform soluble fraction of the stem have shown some antipyretic effects .
15. Anti- Asthmatic activity	This plant possess' anti-inflammatory property which reduces the frequent cough, cold tonsil that may lead to respiratory problems
16.Hypolipidemic effect	The root extract of <i>Tinospora cordifolia</i> is known to reduce the serum/ tissue lipid level.
17.Anti-osteoporotic effect	<i>Tinospora cordifolia</i> has a significant role in the treatment of osteoporosis and osteoarthritis. Alcoholic extract of this plant stimulates the growth of osteoblasts, increases the differentiation of cells into the osteoblastic lineage and also increases the mineralization of bone-like matrix.
18.Antistress activity	Ethanol extract of the plant <i>T. cordifolia</i> produces antistress affects.

**Distribution:** It is mainly found in tropical areas. In India it is primarily found in Asam, Bihar, Arunachal Pradesh, Gujrat, Goa, Kerala, Maharashtra, Odisha, Sikkim, Uttar Pradesh, West Bengal.

#### Phytochemicals present in the different parts of Giloy:

- ) **Stem:** various phytochemicals are extracted from the stem.
- ) **Whole Plant:** various phytochemicals are extracted from the whole plant.
- ) **Root:** various phytochemicals are extracted from the root.

**Giloy (*T. cordifolia*) as a folk medicine:** Almost 60% of population in India still uses herbs in their own way to treat various ailments. And these methods are passed verbally from one generation to another.

- ) The pills made by the paste from the stem of the Guduchi and the roots of Bhatkatiaya is being used by the tribals people of some regions of the Uttar Pradesh for the treatment of fever.
- ) *T. cordifolia* drug is used in the treatment of fever, jaundice, chronic diarrhea and dysentery by tribals of Mumbai.
- ) The tribals of Khedbrahma region of North Gujarat use the plant as food or medicine in their daily life. And powdered root, stem and bark of *T. cordifolia* is taken with milk for the treatment of cancer.
- ) Liquid extract of stem is administered orally by the people of Jammu (J & K) and Bigwada (Rajasthan) for the treatment of fever.
- ) The warm juice root is taken orally in the treatment of fever by dome folks of Bhuvneshwar.
- ) Some locals of Patiala (Punjab) use leaf juice with honey for treating fever.
- ) It is being used in the bone fracture by the muslim tribe of Jammu along with Gujjars.
- ) Some tribals of Maharashtra Dahanu forest viz. Agaris, Bhils, Dhodias, Dublas, Khakar, Rimoshis, Thakurs, Vardaris, Vagharis and Varlis use the stem juice with water as a tonic in general debility.
- ) Giloy is also used as ear drops in the treatment of ear pain by some folks of Patiala.
- ) Guduchi (*T. cordifolia*) paste and 5 seeds of Krishna marich (*Piper nigrum*) is taken orally daily in morning

- ) in leucorrhoea by Arjunpura's (Rajasthan) local women.
- ) Some locals of Badla (U.P.) use the stem juice orally with honey in Asthma.
- ) Liquid extract of stem is taken orally by the people of Sivpuri (M.P) in skin diseases.

**Giloy as an Ayurvedic medicine:** Ayurveda is the characteristics arrangement of medication. Ayurveda has great significance in blocking and inspiring the maintenance of health through close attention to balance in one's life, right thinking, diet, lifestyle and the use of herbs. The most known content on Ayurveda are the CHARAKA SAMHITA, SUSHRUTA SAMHITA and ASHTANGA HRUDAYA. These contents detail the affect that the five elements found in the global system Earth, Water, Air, Fire and Space. These constitutions are sorted into 3 Doshas:

- ) VATA (the energy of movement); where air and space rules
- ) PITTA (the energy of metabolism and digestion); where fire rules
- ) KAPHA (the energy of lubrication); where earth and water rules

**Rasa Panchak of Giloy:** Giloy is a divine herb in Ayurveda. It is a tridosha sedative. Useful in maintaining Vatta. Giloy powder is beneficial in treating Pitta ailments. Different medication systems have decribed different different uses of giloy. In the Sushrut Samhita it is useful for treating Kustha (leprosy), Maha-jvara (High-Fever), Svasa (asthma) and Aruchi (anorexia). In Charak Samhita and Ashtang Hridaya, giloy is used for diseases like Kamala (Jaundice), Jvara (Fever) and Vat Rakta (Gout), etc. In Bhava Prakash, it is taken as bitter tonic, diuretic and potent aphrodisiac and curative against skin infection, diabetic and Chronic diarrhoea and dysentery. In Dhanvantari Nighantu, it is mentioned for bleeding, curing itching. It also used for several disabilities like seminal weakness in urinary affections and in different form of diabetes.

In Ayurveda it is mentioned that giloy intake increases total blood count, platelets count. It is also useful in treating joint pain, arthritis, restlessness, constipation, TB, inflammatory diseases, itching, jaundice. In Ayurveda medication system giloy is also used in treating memory loss, reduces signs of ageing. Leaf decoction of giloy is good for acne, pimples. Giloy has significant role in treating heart diseases and cancer. It is said that it increases the process of activation of sperm. In this way Giloy is a complete rejuvenation yoga, also a purifier and energy booster.

Giloy in Modern Medicine System: From last two decades we have seen the mixing of ethnobotanical (use of plants by humans as medicines), phytochemical (chemical occurring in plants) and pharmacological (drug action) studies. From the modern techniques (separation, structure determination and screening) humans have developed latest drugs from the natural resources like medicinal herbs etc. Until 1930, around 90 per cent of the drugs were of plant origin. Then began the period of chemotherapy with the synthesis of sulphonamides and the era of antibiotics began in the following decade. In modern era people are very much concerned regarding their health and they look for the products which are really beneficial and harmless as well as reliable. Giloy is one such herb which possess all the goodness which people are looking for but when it used in immunity products its quality gets alter either due to other inorganic/organic ingredients or due to modern manufacturing processes. Giloy (*Tinospora cordifolia*) is a widely used herb and have many diverse ethno pharmacological and medicinal applications.

### Conclusion

*T. cordifolia* is significant therapeutic plant which secures a very significant position in Ayurvedic arrangement of medications for anticipation and medicines of different human diseases. As a result of quality of different sorts of phytochemicals in Giloy, it has discovered applications in drug science because of its antiosteoporotic, hepatoprotective, immunomodulatory, antihyperglycemic, hostile to tumor, against HIV properties.

### REFERENCES

- Bhatt RP, Sabnis SD. 1987. Contribution to the Ethnobotany of Khedbrahma region of North Gujarat. *J Econ Tax Bot.*
- Devi G. 2020. Medicinal plant: Giloy. *International Journal of Current Research.*
- Fatima Z, Khare E. 2020. A mini review on cucumber & giloe: a neuroprotective & immunomodulator agent. *Plant Archives.*
- Ghildiyal JC, Juyal P, Sadana G. 2014. Indigenous uses of plants in different women ailments in Garhwal region. *Indian Journal of Pharmaceutical and Biological Research.*
- Gupta BM, Kaur J, Baidwan K, Gupta R. 2018. Global Research on *Tinospora cordifolia* (Medicinal Plant) with special reference to India: A scientometric assessment publications output during 2001-2016. *International Journal of Pharmacognosy and Chinese Medicine.*
- Mittal J, Sharma MM, Batra A. 2014. *Tinospora cordifolia*: a multipurpose medicinal plant-A review. *Journal of Medicinal Plants.*
- Muddgal D, Sachitra. 2019. *Dravyagunn Vigyan. Ayurveda Sanskrit Hindi pustak bhandar.*
- Nazir I, Chauhan RS. 2018. Qualitative phytochemical analysis of *Tinospora cordifolia* and *Withania somnifera*. *The Pharma Innovation Journal.*
- Pandey MM, Rastogi S, Rawat AK. 2013. Indian traditional ayurvedic system of medicine and nutritional supplementation. *Evidence-Based Complementary and Alternative Medicine.*
- Parida B, Bagartee D. 2020. Giloy: a boon for mankind. *International Research Journal of Modernization in Engineering Technology and Science.*
- Prasad B, Chauhan A. 2019. Anti-Oxidant and antimicrobial studies of *Tinospora cordifolia* (Guduchi/Giloy) stems and roots under in-vitro condition. *Int. J. Adv. Microbiol. Health. Res.*
- Promila SS, Devi P. 2017. Pharmacological potential of *Tinospora cordifolia* (Willd.) Miers ex hook. & Thoms. (Giloy): A review. *JPP.*
- Rajvanshy T, Patel J. 2002. *Tinospora cordifolia*: A fountain of life force. *International Journal of Homoeopathic Sciences.*
- Rani B, Bhatti I, Abid M, Kazmi SHA, Punar S, Maheshwari RK. 2017. Classically eclectic therapeutic applicability of *Tinospora cordifolia* (Giloy\ Guluchi). *J. Biol. Chem. Research.*
- Reddy NM, Reddy RN. 2015. *Tinospora cordifolia* chemical constituents and medicinal properties: a review. *Scholars Academic Journal of Pharmacy.*
- Saeed M, Naveed M, Leskovec J, Kakar I, Ullah K, Ahmad F, Sharif M, Javaid A, Rauf M, Abd El-Hack ME, Abdel-Latif MA. 2020. Using Guduchi (*Tinospora cordifolia*) as an eco-friendly feed supplement in human and poultry nutrition. *Poultry Science.*
- Sarangi MK, Soni S. 2013. A Review on Giloy: The Magic Herb. *Inventi Rapid: Planta Activa.*
- Saxena C, Rawat G. 2019. *Tinospora cordifolia* (Giloy)-Therapeutic Uses and Importance: A review. *Current Research in Pharmaceutical Sciences.*
- Shah GL, Yadav SS, Badri N. 1983. Medicinal Plants from Dahanu Forest Division in Maharashtra State. *Journal of Economic & Taxonomic Botany.*
- Shah GL. 1984. Some economically important plants of salsette island near Bombay. *J Econ Tax Bot.,*
- Sharma A, Gupta A, Singh S, Batra A. 2010. *Tinospora cordifolia* (Willd.) Hook. F. & Thomson-A plant with immense economic potential. *J. chem. pharm. Res.*
- Sharma DN, Sharma A. 2015. *Tinospora cordifolia* Enhances Vyadhikshamatwa (immunity) in Children. *The Journal of Phytopharmacology.*
- Sharma P, Dwivedee BP, Bisht D, Dash AK, Kumar D. 2019. The chemical constituents and diverse pharmacological importance of *Tinospora cordifolia*. *Heliyon.*
- Shervani ZA, Mishra PK. 2020. Cytological study of *tinospora cordifolia* (willd.) miers ex hook f. & thoms. growing in four different places of hazaribag (jharkhand). *Plant Archives.*
- Singh D, Chaudhuri PK. 2017. Chemistry and pharmacology of *Tinospora cordifolia*. *Natural product communications.*
- Singh KK, Maheshwari JK. 1983. Traditional phytotherapy amongst the tribals of Varanasi district, Uttar Pradesh. *Journal of economic and taxonomic botany.*
- Sudhakaran DS, Sreerika P, Devasree LD, Premsingh S, Michael RD. 2006. Immunostimulatory effect of *Tinospora cordifolia* Miers leaf extract in *Oreochromis mossambicus*. *Indian Journal of Experimental Biology.*
- Tripathi BM, Singh DC, Chaubey S, Kour G, Arya R. 2015. A critical review on guduchi (*Tinospora cordifolia* (willd.) miers) and its medicinal properties. *Int. J. Ayur. Pharm. Res.*
- Upadhyay RK, Tripathi R, Ahmad S. 2011. Antimicrobial activity of two Indian medicinal plants *Tinospora cordifolia* (Family: Menispermaceae) and *Cassia fistula* (Family: Caesalpinaceae) against human pathogenic bacteria. *J Pharm Res.,*