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Potential role and assessment of medicinal properties of Giloy (*Tinospora cordifolia*)

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Abstract

The Indian subcontinent is home to the herbaceous plant giloy. The researchers have investigated a variety of medicinal uses for it over time. It is a huge remedial plant. Giloy is a climbing shrub that can be found growing on other trees. It is a member of the Menispermaceae botanical family. (Danahy, 2021) India has a wide variety of wild plant species, many of which have been used as medicines since antiquity. These plants can be used to make a wide variety of natural products and medicines. In addition, these medications are distinguished from other allopathic products by the fact that they are nontoxic and have fewer side effects. Natural products are also in high demand as public awareness grows each day. One of the useful medicinal plants is Giloy (*Tinospora cordifolia*), which can be consumed either immediately. Theory after it has been prepared. It is used to treat a variety of illnesses, including chronic fever, dengue fever (by increasing platelet count), allergic rhinitis, and virus infections. It also controls blood sugar levels, boosts immunity, improves digestion, reduces stress and anxiety, treats arthritis and gout, improves eye sight, and its properties aid in the regeneration of the skin and increase the level of collagen, among other things. It contains parts like alkaloids, polysaccharides, steroids and glycosides. Giloy can be consumed in a variety of ways, including directly chewing the stem and leaves or boiling them in water. We can also use the powder, and Giloy juice and tea are also available on the market. Giloy is extremely beneficial to both humans and animals.

Keywords: Guduchi, Ayurveda, Tinospora, anti-pyretic, Giloy juice

Introduction

Tinospora cordifolia, more commonly referred to as Guduchi or Giloy, has been used in the Unani and Ayurvedic medical systems for centuries. It is native to the Indian subcontinent, but it can also be found in tropical and subtropical areas of South Africa, Australia, Thailand, Indonesia, Malaysia, North Vietnam, Bangladesh, China, and other countries. In earlier centuries, when therapeutics and allopathic medicines were not popular, people used to make Phytomedicines - also known as botanical medicines—by combining one or more herbs of a particular quality and quantity. These medicines were then used for diagnosis, cosmetics, and the treatment of human and animal diseases. In the literature of Indian Ayurveda, the Giloy plant is mentioned as a potent Rasayana remedy. It is regarded as a potent immune modulator and bitter tonic. Giloy improves memory, increases intelligence, and aids in mental clarity. In the Charak Samhita, it is referred to as one of the Medhya Rasayana, which means "mental rejuvenation." For long it has been utilized in India as a medication and in the planning of a starch known as Giloy - ka-sat or as palo which is supposed to be a tonic, antiperiodic, and a diuretic. *T. cordifolia*, which is also known as Amritvali, Amara, Vatsadani, Chinnaruha, and Chinnodebha, is also known as Giloy or Amrita. According to the sushurta samhita in Tikta-Sakavarga, it is said to treat diseases like Aruci (anorexia), Maha jvara (fever), Kustha (leprosy), and Svasa (fever). In relation to the Charka Samhita and the Ashtang hridaya, there is evidence that it can be used to treat diseases like Kamala (gout), Jvara, and Vat rakta. Additionally, it is used as a diuretic, bitter tonic, potential curative, and astringent in Bhavya Prakash. It is used to treat erysipelas, piles that are bleeding, and itching in Dhanvantari nighantu [1, 2, 3, 4, 5].

There are 34 species in the *Tinospora* genus, many of which are used as traditional medicines in Asia, Africa, and Australia. *T. hainanensis* and *T. guangxiensis* Lo. For instance, are two varieties found in China. These herbs are used as home remedies to treat colds, oral ulcers, rheumatoid arthritis, diarrhoea, headaches, and other conditions. In India, the *T. cordifolia* species is grown, and it is frequently used to treat diabetes and boost immunity by preventing upper respiratory infection. *T. cordifolia* has been listed as one of 29 highly prioritized medicinal plants of agroclimatic zone 8 (Rajasthan, Uttar Pradesh, and Madhya Pradesh) because of its high demand of India as determined by the Indian government's National Medicinal Plant Board in New Delhi. The NMPB in New Delhi, India, also included this plant in its list of 178 medicinal plant species with high volume trade. For medicinal purposes, all plant parts, including the stem, leaves, and roots, are utilized. Externally, pain and oedema can be effectively treated with giloy paste and oil. Giloyyadi churna, Amrita guggulu, Sudarshan churn, Giloyyadi churna, Rasnapanchak Kwath, Sanjivni vati, Guduchyadi taila, giloy sattva, Giloyadi kwath, and Kishore guggulu are among the most well-liked. It is estimated that Ayurvedic pharmaceuticals consume 1,000 tons of crude giloy annually, and as public awareness grows, so does demand for giloy's crude and aqueous extract [6, 7, 9, 10, 11]. According to Ayurveda, Giloy can be polished off in either a powdered structure or can be as kadha (Decoction) or even squeeze. It is now also available as ready-made powder and capsules. Giloy was also applied topically as a paste to treat skin issues. Giloy is usually taken twice daily, one teaspoon at a time. The dosage might be different for different health issues. Giloy juice can only be made with clean, chopped plant branches. A cup of water and these chopped branches are combined to make a fine, green liquid paste. To make Giloy juice, strain this green paste through a sieve. Giloy contains several immunomodulatory active compounds, including N-methyl-2-pyrrolidone, N-formylannonain, magnoflorine, tinocordiside, cordifolioside A, 11-hydroxymustakone, and syringing (Sharma, *et al.*, 2019). Giloy has been used in Ayurvedic and Unani medicine since ancient times. As a medicine that boosts the immune system and is used to treat a wide range of ailments, including diabetes, fever, jaundice, arthritis, diarrhea, and headaches, it is most commonly found in China and India. Giloy is a simple plant to grow, and every part of the plant is used to make powder, paste, juice, and other products. *T. cordifolia* demand has increased as market awareness has grown, resulting in 1,000 tons of production annually. This truly is a miraculous herb that can be utilized for any condition. The worldwide exploration reasons that a plant with as different a job as *Tinospora cordifolia* is a flexible asset for all types of life. The plant extracts contain active compounds in the form of alkaloids, glycosides, lactones, and steroids, according to published reports. Giloy, like other herbal treatments and medications, is not approved by the Federal Drug Administration and may cause constipation as a side effect. Therefore, in addition to the clinical trials, additional research is required to demonstrate this herb's benefits. *Tinospora cordifolia* for its potential for disease prevention and treatment, which highlights the necessity of conducting research on the plant in order to obtain medicines of significance [12-20].



Fig 1: Giloy plant

Different taxonomic ranks in the biological classification system

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

Tinospora cordifolia (willd.) Miers ex Hook. F. and Thoms belonging to the family Menispermaceae, it is a large, deciduous, climbing shrub that belongs to the family Menispermaceae and is found in India, particularly in the tropical regions that rise to 300 meters above sea level, as well as in some parts of China. Typically, planting is done during the rainy season (July through August). For cultivation, Giloy requires medium black or red soil. It can also be grown successfully in a wide range of soils, from sandy to clay loam, as shown in Figure 1 [1, 21, 60].

Plant morphology

It is a large climbing shrub that spreads widely and is deciduous. It has several different-shaped coiled branches. The plant's stem is filiform, fleshy, and climbs; The bark is grayish-white. The powder of the stem is used to treat dyspepsia, fever, and urinary tract infections. It is creamish brown or dark brown, has a distinctive odour, and has a bitter taste. The "Guduchi-satva" starch comes from the stem. It is very beneficial to digestion and nutrition. This plant has alternate, simple, long-petioled leaves (about 15 cm in length); heart-shaped, pulvinate, and partially round halfway around; The lamina is membranous, ovate, 10–20 cm long, with seven nerves and a deeply cordate base. The flowers are unisexual, axillary, 2–9 cm long, greenish-yellow in colour, male flowers are typically clustered, and female flowers are typically solitary. It produces single-seeded fruits throughout the winter and flowers during the summer. The primary structure of the aerial, thread-like, Squair shin root is tetra to penta arch, and its lengthening can sometimes continue to touch the ground. The endocarp is ornamented in a variety of ways, and the curved shape of the seeds are important taxonomic characteristic [23-26].

- Gurcha is a gregarious glabrous, twiner
- Aerial roots arise from nodal scars of branches.

- Stem and branches are speckled with white vertical lenticels. The corky bark of older stems can be up to 2 centimetres in diameter.
- Branch nodal scars are the source of aerial roots.
- The bark is warty, paper-thin, grey-brown or creamy white, and it peels off easily.
- The leaves are ovate, acute, and 5–15 cm long. At first, they are membranous, but as they get older, they become more or less leathery

Pedicle

This plant's stem is long, filiform, fleshy, and climbing in nature. It is succulent. The branches give rise to aerial roots. The bark is deeply left spirally and is creamy white to grey in colour. Use of the stem:

- Use the giloy stem. Use a stone pestle to crush it into a paste in a stone mortar.
- The alkaloids and high nutritional content of the Giloy stem make it highly effective, but the root leaves can also be utilized [27, 28, 29].
- Giloy is one of the primary bitter herbs, according to a shloka in the Charak Samhita. Squeeze the paste and extract the juice. 5 millilitres of fresh giloy juice can be consumed two to three times per day (figure 2b).

Arial Roots

Tetra considers these aerial roots to be the primary structure of a penta-arch. In contrast, the inner parenchymatous zone and the outer thick-walled cortex of the root are separated [2, 30, 31].

Flower: This plant has simple, alternate, exstipulate, long, 12 to 15 centimeter-long, round, pulvinate, twisted partially, heart-shaped, and half-round leaves. The membrane of the lamina is ovate, 10 to 20 centimetres long, 7 nerved, deeply cordate toward the base, and membranous (figure 2a) [3, 32-34]. When the plant has no leaves on it, it produces single, minute, greenish-yellow flowers. Male flowers are arranged in groups, while female flowers form a single inflorescence. Sepals have six each in two series of three. The inner sepals are larger than the outer ones. Petals are also membranous, free, and six times smaller than sepals. Occurrence of flowering from March to June (figure 2c) [4, 35].

Fruit: They are fleshy, ranging in color from orange to red, smooth, and avoid the drupelets that grow on a thick stalk through subterminal style scars. Winter is when fruit develops (figure 2d).

Seed

In this species, curved seeds have been reported. Consequently, this family is also known as the moonseed family. The embryo is also automatically shaped in the same way that seeds are. Additionally, the endocarp is ornamented in a variety of ways and contains important taxonomic characteristics [5, 6, 36, 37, 38].

Dosage

The oral dosage of Giloy in classical literature ranges from 4 to 9 grams per day. However, the Unani Pharmacopoeia recommends a daily oral dose of 5-10 gram.

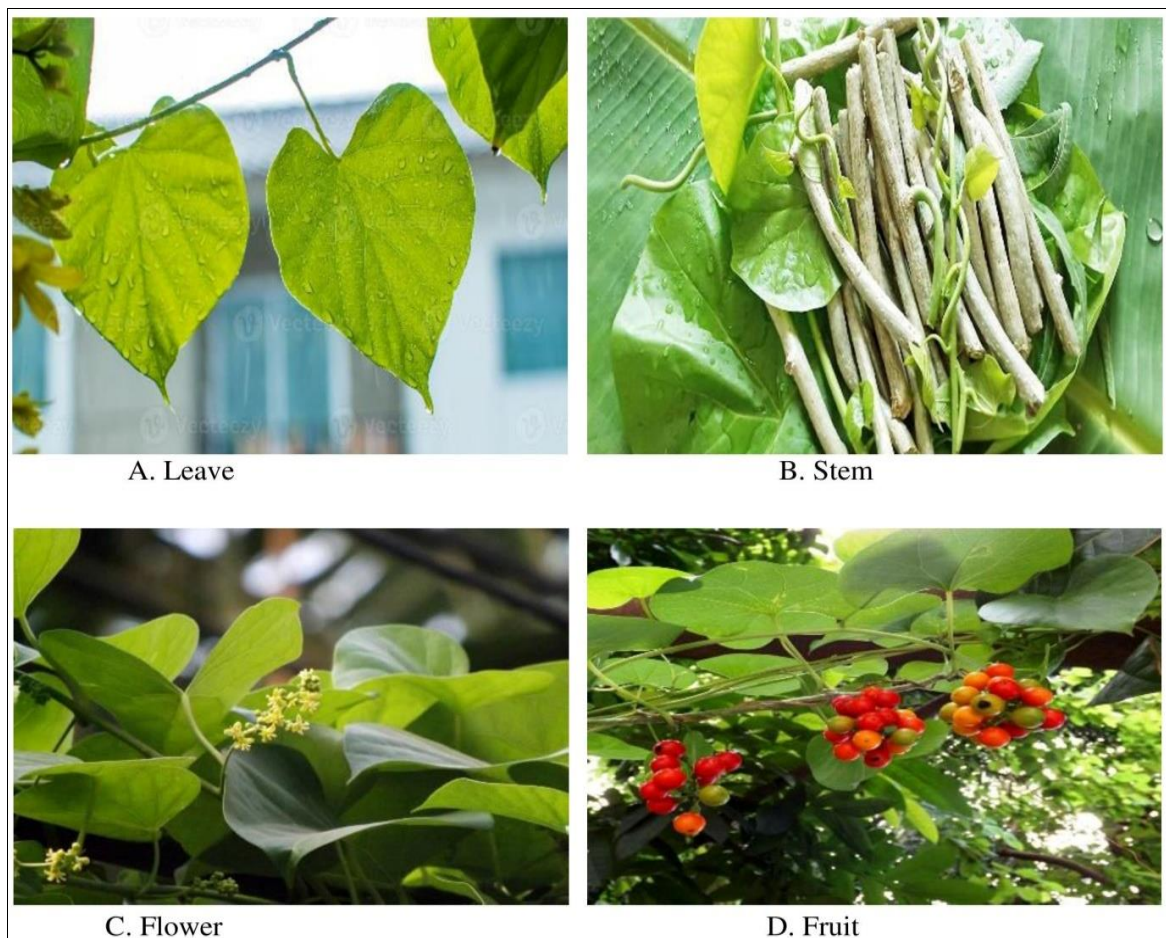


Fig 2: A) Leaves, B) Stem, C) Flower, D) Fruit

Climatic Condition and Soil Type

The climate of the plant is subtropical and tropical.

- It grows well in medium-heavy, sandy loam soil that has good drainage and is rich in organic matter.
- It cannot withstand excessive precipitation or waterlogged conditions.

Distribution

- The species is native to India and can be found at 600 meters above sea level in tropical and subtropical regions [39, 40, 41].

Agricultural techniques**Raising propagules**

- The stem cuttings are sown in the field right away.
- Older stems with nodes and internodes are used to take cuttings.
- After cuttings have been removed from the parent plant, they should be sown within 24 hours. In the meantime, they ought to be vertically dipped in half water.

Propagule rate and pre-treatment

- One hectare of land requires approximately 2500 cuttings for plantation.
- No particular treatment is required prior to sowing.

Harvesting procedure

- The land is harrowed, ploughed and made weed-free.
- At the time of land preparation, a base dose of FYM (farmyard manure) of approximately 10 tonnes per hectare and a half dose of nitrogen (approximately 75 kg) are applied.

Transplanting and optimum spacing

- The cut stem and nodes are directly sown in the field.
- For increased yield, an optimal spacing of 3 m x 3 m is recommended.
- To grow, the plant needs support, which can be provided by trellises or wooden stakes.
- The plant may also be supported by trees or shrubs that were growing before.

Intercropping

- Because it is a larger twiner, it needs a host to twine and covers the host quickly.
- When stem cuttings with aerial roots are thrown over trees, they begin to grow and strike ground roots as well.

Cropping: When the stem reaches a diameter of more than 2.5 centimeters, it is harvested in autumn. The basal portion remains for subsequent growth.

Post-Harvest Management

- The stem ought to be broken up into small pieces and dried in the shade.
- It can be kept cool and airy in storage godowns and gunny bags.
- Because stem bark peels off even when touched, it should be carefully removed because peeled stems quickly decompose.

Chemical Components: There are bitter substances in the stem, one of which is the marker compound tinosporine, which is a bitter principle.

- Other compounds with furanoid terpenes include gilonin, giloinin, and gilosterol.

Production

The plant produces approximately 1500 kilograms of fresh woody stem, which is reduced to 300 kilograms of dry weight per hectare in about two years [7, 8, 42-45].

Chemical components

Giloy's chemical components include glycosides, steroids, polysaccharides, phenolics, aliphatic compounds, alkaloids, and glycosides. The leaves are also high in calcium, phosphorus, and protein (11.2 percent). The active components of *T. cordifolia*'s stem and root are alkaloids. These include tembetarine, magnoflorine, tinosporin, isocolumbin, jatrorrhizine, berberine, aporphine alkaloids, choline, tetrahydropalmatine, palmatine, and cleodrane derivatives [(5R, 10R)-4R-8R-dihydroxy-cleroda-13 (16), 14-dieno-17, 12S:18]. They have biological properties like Vasorelaxant, anti-inflammatory, anti-viral, anti-microbial, and anti-hypertensive. Steroids (-sitosterol, Makisterone A, -sitosterol, giloinsterol, 20-hydroxyecdysone, and ecdysterone) can be found in the shoot portion of *T. cordifolia*. They are effective against early inflammatory arthritis osteoporosis caused by glucocorticoids. Through c-Myc inhibition, they tempt cell cycle arrest in the G2/M phase and inhibit TNF-, IL-1, IL-6, and COX-2, as well as apoptosis.

Glycosides are present in the stem of *T. cordifolia*. Tinocordifolioside, 18-norcleodrane glucoside, cordifolioside A, B, C, D, and E, Furanoid diterpine glucoside, Cordioside, Syringin, pregnane glycoside, Syringin-apiosylglycoside, and palmatosides are their active ingredients. In Parkinson's disease, dementia, motor and cognitive disorders, and neurological conditions like ALS, they demonstrated immunomodulation. They have anti-cancer properties because they block the NF- κ B [35-41]. The entire *T. cordifolia* plant contains aliphatic compounds. Octacosanol, Nanocosan15-one dichloromethane, and Heptacosanol are the active components. They had anti-inflammatory and anti-nociceptive properties. They additionally restrain TNF- α from restricting to the DNA and give assurance against 6-hydroxydopamine-prompted Parkinsonism in rodents. The other parts of *T. cordifolia* contain active constituents like Jatrorrhizine, Tinosporic acid, 3, (a, 4-di hydroxy-3-methoxy-benzyl)-4-(4-hydroxy-3-methoxy-benzyl) tetrahydrofuran, N-trans-feruloyl tyramine as diacetate, and Giloin. The stem of *T. cordifolia* contains sesquiterpenoids. They demonstrated an HIV (human immunodeficiency virus) protective effect. Diterpenoid furano lactone, cordifolide, cordifol, heptacosanol, tinosporide, -sitosterol, tinosporine, clerodane furano diterpine, tinosporaside, and columbin are the primary phytoconstituents of *T. cordifolia*. From the stem of *T. cordifolia*, alkaloids such as magniflorine, Berberine, palmatine, non-glycoside gilonin, gilosterol, tembetarine, choline, and tinosporin have been reported [7-10, 46, 47].

Some of the components present in giloy are listed in below figure-

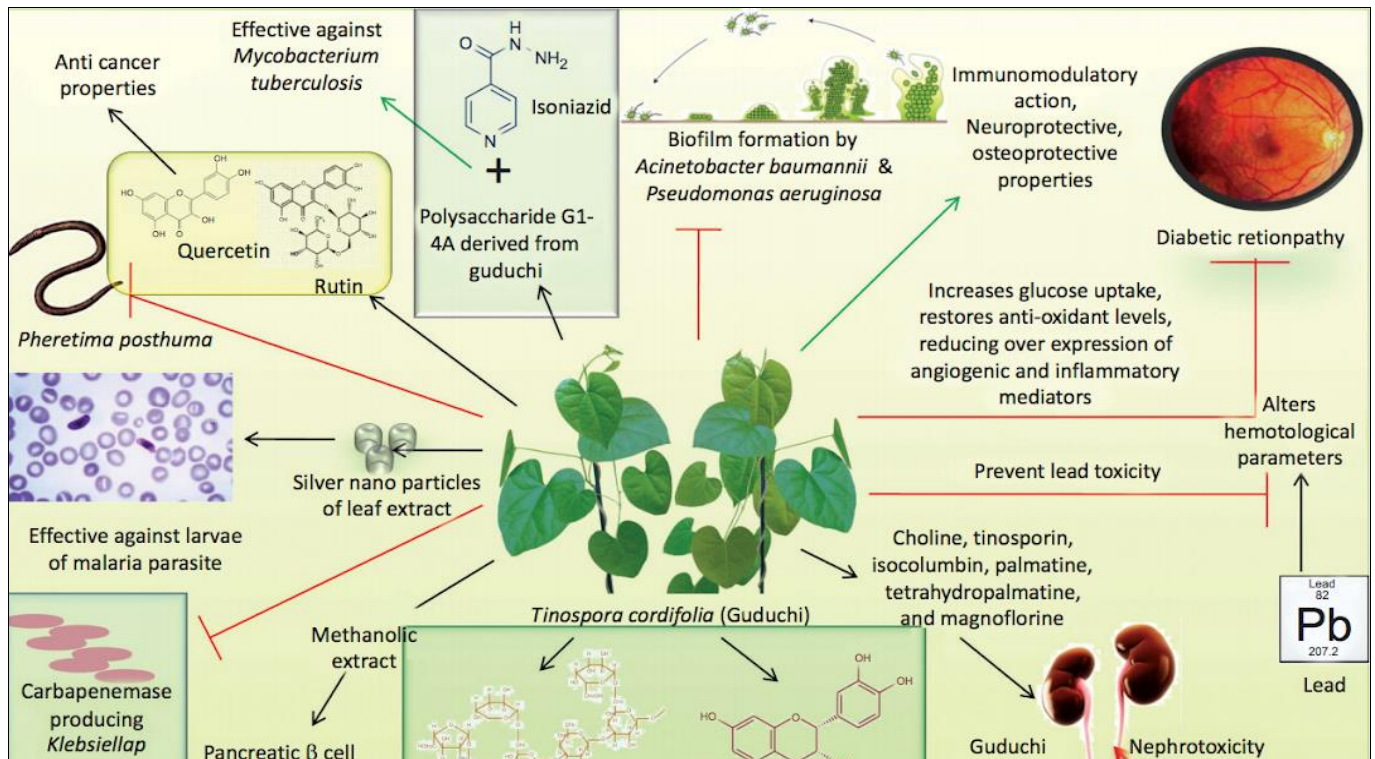


Fig 3: Medicinalplant101.blogspot

Pharmacological activities

There are various pharmacological activities are seen by the researchers in Giloy.

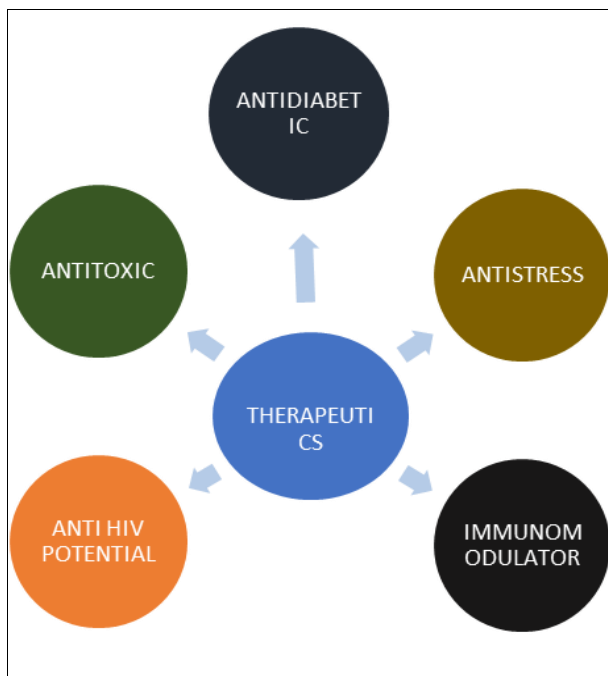


Fig 4: Therapeutics

Antidiabetic Activity

1. Giloy-derived alkaloids, saponins, flavonoids, cardiac glycosides, tannins, and steroids have been found to be effective against diabetes. Giloy's alkaloids are said to have the same effect as insulin and show insulin-mediated actions. Gestational diabetes can raise the amount of GSH and other reactive species in the body, both of which can harm the mother and the fetus. However, when Giloy is administered to a diabetic pregnant rat (streptozocin-

induced diabetes), it exhibits a protective effect by lowering the oxidative load, thereby reducing the proportion of diseases and birth defects. Giloy root extracts reduce blood glucose levels and lower urinary glucose levels in a diabetic rat model, highlighting their anti-diabetic and lipid-lowering properties [17, 18, 19, 48].

2. When rats were given an aqueous Giloy extract, the fructose-induced liver abnormalities involving lipid peroxidation, protein carbonyl groups, GSH levels, and enzymatic antioxidants tend to decrease when the plant's extract was administered [20, 49, 50]. Without the *Tinospora cordifolia* extract, the glucose level increased by 21.3 per cent, insulin by 51.5 percent, the glucose-insulin index by 59.8 per cent, and triglycerides by 54.

3. One of the world's major health issues, diabetes mellitus is increasing in prevalence and mortality. The health consequences of inadequate blood sugar regulation are severe. Despite their effectiveness, conventional antidiabetic medications come with undesirable side effects. On the other hand, medicinal plants may be able to substitute for other sources of antidiabetic drugs. In Ayurveda, Giloy is referred to as "Madhunashini," which means "destroyer of sugar." The production of insulin is helped by this activity. Giloy slows down digestion due to its high fiber content [51, 52].

Anti-Toxin Activity

It has been reported that *T. cordifolia* can reverse the toxicity caused by aflatoxin synthesis in Swiss albino mice's kidneys by significantly increasing the levels of hormones like glutathione and enzymes like catalase and glutathione reductase; in addition to lowering the number of reactive oxygen species (ROS). The plant of *T. cordifolia* contained alkaloids such as tinosporin, isocolumbin, choline, magnoflorine, tetrahydropalmatine, and palmatine that protected the kidneys from aflatoxin-induced nephrotoxicity [11-14, 53].

On the other hand, the leaf and stem extract of Giloy works against these changes by overcoming the lead which induced toxicity over haematological value. This herbal plant extract when given orally has also reported to respond to the toxic effects caused by lead nitrate in mice (Swiss albino) liver. The study shows a decrease in level of the enzymes like glutamic pyruvic transaminase (GPT) or alanine aminotransferase (ALT) and aspartate aminotransferase (AST) and a rise in the enzyme responsible for scavenging free radicals such as catalase. Giloy has found its significance by overcoming cyclophosphamide-induced toxicity by substantially elevating the level of lowered GSH content, cytokines and steadily declining inflammatory cytokines (Tumor necrosis factor) level in urinary-bladder and hepatic cell preventing the damage which has its anti-toxin activity [15, 16, 54].

Anti-stress Activity

Sarma *et al.* stated that when 100 mg/kg ethanolic extract of Giloy was given the antistress activity in all parameters changes to a moderate degree of behaviour disorders as well as in mental deflect response, it increases the IQ level, increase the mind power like recollection and memory [21, 60, 55]. Ethanolic extract of the plant produces anti-stress activity. The presence of flavonoids and polyphenols in *Tinospora cordifolia* attributes to its free radical scavenging activity. Giloy serves as a source of nutraceuticals that alleviate oxidative stress and helps in the prevention and reduction of chronic degenerative diseases with consequent health benefits. (March 2020, Harshita Jain).

Immunomodulatory Activity

Giloy-derived syringing (TL-4) and cordial (TC-4) inhibit guinea pig serum-induced *in vitro* immune haemolysis of antibody-coated sheep erythrocytes. The inhibition of the C3-convertase of the classical complement pathway reduced immune haemolysis. In guinea pig serum, the compounds of *T. cordifolia* cause significant increases in IgG antibodies [23-26, 56].

When Macrophage cells are exposed to *T. cordifolia* extract, they increase the production of various enzymes, including "myeloperoxidase," which enhances the anti-microbial action to protect the immune system. Giloy stem also alters the level of enzymes like catalase and stimulates lymphocyte cells to maintain immune strength, highlighting the immuno-protective role of this shrub. *T. cordifolia* is a potent agent for the prevention of immune-susceptible diseases [27-29, 57] because it can also increase the response of immune cells and neutrophil activity.

Anti-HIV Potential

Kalika and others stated that giloy reduces HIV-positive patients' resistance to the retroviral regimen, which aids in treatment. It reduces the patient's eosinophil count while increasing the patient's number of CD4 T cells. Giloy extract increases intracellular and phagocytic bacterial activity [30, 31]. It is ingested by humans to prevent diseases like COVID-19 [32]. The most important medicinal plants for boosting human immunity are ashwagandha, Giloy, and Tulsi [32-35, 57].

Antioxidants

It was concluded that *Tinospora cordifolia* exhibited excellent antioxidant activity in methanol, ethanol and water

extracts. The observation indicates the potential of the stem as a source of natural antioxidants or nutraceuticals to reduce oxidative stress with consequent health benefits. In conclusion, our results conclude the potential antioxidant activities of Giloy leaf as well as stem and therefore, it can be used as a source of antioxidant for health benefits through dietary supplementations [19, 58].

Mental Disorder

The juice of this plant's leaves is traditionally used in various mental disorders. This plant is regarded as one of the best psychotropic drugs in India. Giloy is a source of many important plant compounds, namely terpenoids, alkaloids, lignans, and steroids. This study reviews physical, chemical, and medicinal properties of the plant along with the treatment procedures for several diseases.

Radiation Therapy

An article published in "Evidence-based complementary and alternative medicine" state that Giloy may help to prevent the negative side effects of radiation treatment and it may also be effective in preventing infertility and related problems in men who undergo radiation treatment.

Against Aids

As per the article published in the "Indian journal Pharmacology" 60% of HIV patients who received placebo treatment reported a decrease in disease. It suggests that Giloy may improve the immune system of person with HIV and other immune disorders. The stem extract of *Tinospora cordifolia* decreases the ability of eosinophil count, stimulation of B-lymphocytes, macrophages, polymorphonuclear leucocytes and level of haemoglobin.

Anti-Diabetic

Diabetes mellitus is one of the major health problems in the world, and the incidence and associated mortality are increasing. Inadequate regulation of blood sugar imposes serious consequences for health. Conventional antidiabetic drugs are effective, however, also with unavoidable side effects. On the other hand, medicinal plants may act as an alternative source of antidiabetic agents. Giloy is described as 'Madhunashini' (destroyer of sugar) in Ayurveda. This activity helps boost insulin secretion. Due to its high content of fibre, Giloy slows down the digestion process and helps the body absorb carbohydrates at a slow rate, thereby controlling blood glucose levels.

Anti-Cancer

The Immune stimulating properties can be used in the prevention of tumour-mediated immunosuppression and could be a drug choice for various cancers. It has anti-neoplastic properties. Ali *et al.*, studied the anticancer activity of *T. cordifolia* palmatine extract in animal models, alkaloid using response surface methodology (RSM). Here are some possible benefits of Neem Giloy in the treatment of cancer:

- In animals, a study revealed that by administering the polysaccharide fraction of *Tinospora cordifolia*, the metastatic potential of melanoma cells was reduced.
- In another study, it was found that Giloy may prevent some negative side effects of radiation.
- It has anti-neoplastic (anti-tumor) properties.

- Up-regulates anti-tumor activity of tumor-associated macrophages (TAM).
- Displays anti-angiogenesis properties (19, 58).

Wound Healing

The body's natural process of regenerating dermal and epidermal tissue is wound healing. When platelets come into contact with exposed collagen, the healing cascade kicks into action, causing platelet aggregation and the release of clotting factors, resulting in the formation of a fibrin clot at the injury site. The fibrin clot sets the stage for the subsequent healing processes by acting as a temporary matrix¹. The connective tissue cell that deposits the collagen needed to repair the tissue injury is the fibroblast. Collagen makes up 30% of the protein in the human body. In ordinary tissues, collagen gives strength, uprightness and design. During the epithelialization process, granulation tissue's tensile strength, collagen deposition, and tensile strength all increased. Giloy also stimulates phagocytic cells, which are the ones responsible for wound healing. It can also be applied as a paste directly to cuts and bruises to speed up the process of skin regeneration.

Benefits of giloy

- The plant oil is beneficial in reducing pain, edema, gout and skin diseases.
- The herbs enhance the memory of an individual, improve health, complexion, voice energy and luster of skin.
- It helps in rectifying ailments like raktapitta, anemia, cardiac debility, diabetes, sexual debility and splenic disorder.
- Its juice when consumed with cow's milk or lodhra is effective in combating leucorrhoea.
- When consumed with cumin seeds it reduces the burning sensation caused due to pitta.
- The roots are used to prevent bowel obstruction.

Consumption of giloy in human diet

There are several ways in which human can inhale the herb into diet. These are-

Juice

Consuming fresh giloy juice can help boost your immune system and counteract the effects of diseases like dengue.

Powder

To boost immunity, giloy powder can be taken with warm water.

Kadha

The herb giloy can be added to a herbal tea called Kadha, which contains ginger, ashwagandha, and other herbs.

Leaf Paste

If you only want to use the herb to improve your skin or heal wounds, you can make a paste from leaves and put it on the area in question.

Capsules

If you or a member of your family is picky about how the herb tastes, you can get giloy in capsules, which are now easy to find on the market. To boost your immunity, take one capsule each day^[32, 59].

Recent use of *Tinospora cordifolia*

Despite the lack of strong clinical evidence for its use, *Tinospora cordifolia*, also known as the heart-leaved moonseed (or Giloy in Hindi and Guduchi in Sanskrit), is widely marketed in India as an "immune booster herbal supplement" with the "potential" to prevent COVID-19. Indeed, immune stimulating properties of Giloy have been demonstrated, with the potential to raise serum immunoglobulin G (IgG) in a small animal model. Giloy use may reveal an autoimmune chronic liver disease (CLD) or cause acute hepatitis with autoimmune features, according to a recent study involving six patients from a single center. Small reports have recently shown an association between Giloy use and the development of herb-induced liver injury (HILI) with autoimmune features in some patients. The 13 centres at nine locations were designed to identify features and outcomes of HILI temporarily associated with Giloy use. They report 43 patients, of whom more than half were female, with a median time from initial Giloy consumption to symptoms onset of 46 days. Causality assessment revealed probable liver injury in 67.4% the most common autoantibody detected was anti-nuclear antibody. (By Vibha Varshney, Sunday 16 May 2021). Giloy is associated with acute hepatitis with autoimmune features and can unmask autoimmune hepatitis (AIH) –related CLD. The notable medicinal property is anti-diabetic, anti-spasmodic, anti-malarial, anti-inflammatory, anti-arthritic, anti-leprotic, hepatoprotective, immunomodulatory and anti-neoplastic activities (32, 58, 59, 60).

Conclusion

To obtain medicines of significance. Giloy has been used in Ayurvedic and Unani medicine since ancient times. As a medicine that boosts the immune system and is used to treat a wide range of ailments, including diabetes, fever, jaundice, arthritis, diarrhea, and headaches, it is most commonly found in China and India. Giloy is a simple plant to grow, and every part of the plant is used to make powder, paste, juice, and other products. *T. cordifolia* demand has increased as market awareness has grown, resulting in 1,000 tons of production annually. This truly is a miraculous herb that can be utilized for any condition. The worldwide exploration reasons that a plant with as different a job as *Tinospora cordifolia* is a flexible asset for all types of life. The plant extracts contain active compounds in the form of alkaloids, glycosides, lactones, and steroids, according to published reports. Giloy, like other herbal treatments and medications, is not approved by the Federal Drug Administration and may cause constipation as a side effect. Therefore, in addition to the clinical trials, additional research is required to demonstrate this herb's benefits. *Tinospora cordifolia* for its potential for disease prevention and treatment, which highlights the necessity of conducting research on the plant in order

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