Evaluation and Formulation of Giloy Tablet
(Tinospora Cordifolia)

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ABSTRACT
Tinosporacordifolia(Giloy) isa medicinal herb used in the Indian Ayurvedic system of medicine due to their health benefits. Giloy is often called ‘amruta’, or the ‘nectar of immortality’. It is specifically known to strengthen the immune system and keep diseases at bay. It can also help deal with other medical issues like diabetes and anxiety. The study includes limitations, evaluation of solid oral dosage form (tablet) from plant extract. Extraction procedures involve use of plant materials like leaf, stem, root and flowers. Many a times samples obtained from single plant are insufficient for the extraction of primary and secondary metabolites. For this reason, samples are taken from randomly selected plants which are used for extraction process.

I. INTRODUCTION
Tinosporacordifolia also called Amrita, Giloy, Guduchi, Amrita,Gurach, Tinospora. It is a large, glabrous deciduous climbing shrub. The stems are rather succulent with longfiliform fleshy aerial roots form the branches. The bark is gray brown and watery. The leaves are membranous andcordate. The flowers small and greenish yellow. This herbisfound throughout tropical asia ascending to a height of300 mts. Tinosporacordifolia also called Amrita, Giloy, Guduchi is widely used in Ayurvedic system of medicine “Rasayan” to the immune system and the bodyresistance against infections [1]. It is a large, glabrousdeciduous climbing shrub belonging to family Menispermacae is widely used in folk and one Ayurvedic system of medicine it is referred as one of the mostversatilerejuvenatingherb. The species is widely distributed in India, Malaysia, Indonesia and Thailand. The Hindi name of the plant is Giloy, a Hindu mythological term that cites to heavenly elixirused by Celestial beings to stay off the aging and tostay young forever [2]. The stem of T. cordifoliais succulent with long filiform aerial roots from the branches. The bark is creamy white to grey, deepyleft rosette like lenticels. The large numbers of compounds have been isolated from the aerial part and roots of T. cordifolia. Flowers are yellow, growing in clusters from nodes. Fruits are drupes, turning red when ripe [3]. A variety of constituents have been isolated from different parts which includes berberin, tinosporaside, tinosporin, tinocordifolioside, cordifolioside A, cordifolioside B, isocolumbin, magnoflorine. It shows the presence of terpenoids, alkaloids, lignan, carbohydrates, bitters, steroids and glycosides. Different constituents like glycoside –giloin and a non-glucoside – gilenin and gilosterolhave been found. The alkaloid tinosporin, tinosporacacid and tinosporol have been identified in the leaves. Tinosporidine and sitosterol isolated from stem, cordifol, heptacosanol and octacosonalleaves anew furanoidtiterpene – tinosporide isolated from stems [4]. One of the most important constituent present in stem of T. cordifolia berberin, anisoqunoline alkaloid having molecular formula C20H18NO4 with molecular mass 336.36122 g/mol. It is yellowcoloured alkaloid which shows strong yellowfluorescence under U.V light. It shows various pharmacological actions which enhances the therapeutic efficacy of this plant problems [5]. T. cordifolia medicinal herb used in the Indian system of medicine due to their health benefits. In modern medicine it is used for the treatment of general weakness, fever, dyspepsia, dysentery, gonorrhoea, urinary diseases, viral hepatitis and anaemia more recently the immunomodulatory properties, antioxidant activity, antineoplastic activity, hypoglycemic activity, antipyretic ahepatoprotective activity, diuretic, anti-stress, anti-hyperglycemic, anti-diabetic and anti-tuberculosis activity were evaluated [6]. Hence regarding this solid oral dosage form of tablet is prepared with improved preformulation and formulation parameters which prove to be useful as an antioxidant as well as antibacterial activity.

MORPHOLOGICAL DESCRIPTION

It is a large deciduous, extensively spreading climbing shrub with several coiled branches with a different type of morphology. Stem of the plant is filiform, fleshy and climbing in nature; bark is white - gray. Powder of the stem is creamish brown or dark brown, characteristic odor, bitter taste and is used in dyspepsia, fever, and urinary diseases. The starch made from the stem known as "Guduchi-satva." It is extremely nutritive and digestive. Leaves of this plant are alternate, simple, long-petioled (approximately 15 cm); round, pulvinate, twisted, heart-shape partially and halfway around. Lamina is ovate, 10–20 cm long, seven-nerved and deeply cordate at the base and membranous. Flowers are unisexual, axillary position, 2–9 cm long leaflet branches and greenish-yellow in colour, male flowers are clustered, female usually solitary. Its fruits are single-seeded, fruits during the winter and flowers grow at the time of summer. The root is thread-like, aerial, squarish, sometimes continuously lengthening touch the ground, aerial roots are characterized by tetra to penta arch primary structure. The seeds are curved shape, and endocarp is variously ornamented, which provide critical taxonomic characters.

- Gurcha is a gregarious glabrous, twiner.
- Older stems are up to 2 cm in diameter and have corky bark.
- Aerial roots arise from nodal scars of branches.
- Stem and branches are specked with white vertical lenticels.
- Bark is grey-brown or creamy white, warty, papery thin, and peels off easily.
- Leaves are 5–15 cm, ovate, and acute.
- They are membranous when young but become more or less leathery with age.
Pharmacognosy of Tinospora Cordifolia

1. Stems - Fleshy
2. Roots - long thread like, aerial, arise from branches.
3. Bark - Thin, greyish or creamy white in colour, when peeled fleshy stem is exposed.
4. Leaves - Cordate (heart shaped), membranous, juicy.
5. Flowers - Bloom during summer
   a. Male flower - Small, yellow or green coloured occur in clusters.
   b. Female flower - Occur singly.
6. Fruits - Pea shaped, fleshy, shiny turn red when boiled.
   Occur in winter
7. Seeds - curved, pea sized.
8. Parts Used: Stems, Roots

9. Distribution: The plant occurs throughout tropical regions of India extending from Kumaon to Assam and Myanmar, Bihar, Konkan to Sri Lanka. It is a large climber which grows over the highest trees in the forests and throws out aerial roots which reach the length of 10 metres, though not thicker than packthread. Sardar Bhagwan Singh PG Institute of Biomedical Sciences and Research, Balawala, Dehradun, Uttarakhand, India.

10. Cultivation: Soil And Climate: It grows well in almost any type of soils and under varying climatic conditions.

11. Nursery raising and planting: The plant is cultivated by stem cutting in the month of May-June. It requires some support preferably Neem and Mango trees, such plants are supposed to possess better medicinal values.

12. Weeding and Hoeing: Periodical hoeing is done, both in the nursery and field as per requirement.

13. Manures, Fertilisers and Pesticides: The medicinal plants have to be grown without chemical fertilizers and use of pesticides. Organic manures like, Farm Yard Manure (FYM), Vermi-Compost, Green Manure etc. maybe used as per requirement of the species. To prevent diseases, bio-pesticides could be prepared (either single or mixture) from Neem (kernel, seeds & leaves), Chitrakmoor, Dhatura, Cow’s urine etc.

14. Irrigation: The field after plantation should be irrigated periodically as and when required

15. Weekly or fortnightly.

16. Harvesting/Post Harvesting Operation: Matur plants are collected, cut into small pieces and dried in shade.

17. Yield: Approximately 8-10 q./ha.

18. Economics: The rate for a kg. of dried stem ranges from
19. Chemical Constituents: The plant mainly contains alkaloids, glycosides, steroids, sesquiterpenoids, aliphatic compounds, essential oils, and a mixture of fatty acids and polysaccharides. The alkaloids include berberine, bittergilonin, non-glycoside giloningilosterol. [2] Thelargest phytoconstituent in Tinospora cordifolia is whole digestinopinose, tinosporide, tinosporalactone, cordifolide, cordifol, heptacosanol, clerdafuranoditerpene, diterpenoidfuranolactone tinosporidine, columbin and β-sitosterol. Berberine, Palmatine, Ternatamare, Magniflorine, Choline, and Tinosporin are reported from the stem. The chemical constituents of Giloy belong to different classes such as glycosides, steroids, polysaccharides, phenolics, aliphatic compounds, and aliphatic leaves. These are mainly tembertarine, magnoflorin, tinosporin, isocolumbin, jatrorrhizine, berberine, aporphine alkaloids, choline, tetrahydropalmatine, palmitinewhich showed anti-cancer, anti-viral, antiinflammatory, antimycotic and anti-pistachiaction. Additionally, the whole plant of T. cordifolia contains furanolactone, Lactones, diterpenoid, Clerodanederivatives [(5R, 10R)-4R-8R-dihydroxy-cleroda-13(16), 14-dieno-17, 12S:18, 1S-dilactone], columbintinosporides, jatorne, and tinosporin. They contain biological actions such as antiinflammatory, Vasorelaxant, anti-microbial, anti-viral and anti-hypertensive. Shoot part of T. cordifolia contains Steroids (B-sitosterol, Makisterone A, δ-sitosterol, gilinositosterol, 20 β-hydroxyecdysone, Ecdysterone). They are effective in glucocorticoid induced osteoporosis in early inflammatory arthritis. They exert on cell cycle arrest in G2/M phase and inhibit TNF-α, IL-1 β, IL-6 and COX-2 and apoptosis through c-Myc suppression. Stem of T. cordifolia contain Glicyosides. Their active constituents are 18-norcloedane, glucoside, Tinosporidioside, Cordifolioside A, B, C, D, E, Funaroididiterpine glucoside, Cordioside, Syringin, pregname glycoside Syringin-apiosylglycoside, palmitosides. They showed immunomodulatory effect in Parkinson's disease, dementia, motor and cognitive disorder, neurological disorders like ALS. They inhibit NF-kB Band toshow anti-cancer properties. 35-41 Whole plant of T. cordifolia contain aliphatic compounds. The active constituents are Octacosanol, Nanocosan15-one dichloromethane, Heptacosanol. They showed anti-nociceptive and anti-inflammatory activity. They also inhibit TNF-α from binding to the DNA and provide protection against 6-hydroxydopamine induced Parkinsonism in rats. Stem part of T. Cordifolia contain Sesquieterpenoids and Tinocordifolin which exhibits an antiseptic activity. The other parts of T. cordifolia contain active constituents such as Jatrorrhizine, Tinosporic acid, 3, (a, 4-di hydroxy-3-methoxy-benzyl)-4-(4-hydroxy-3-methoxy-benzyl) tetrahydrofururin, N-trans-feruloyltyramine as diacetate, Giloin. They showed a protective effect against HIV (human immunodeficiency virus). The chief Phytoconstituents of T. cordifolia are diterpenoidfurano lactone, cordifolide, cordifol, heptacosanol, tinosporide, β-sitosterol, tinosporine, clerdafuranoditerpine, tinosporasides, and columninrespectivel. Alkaloids such as magniflorine, Berberine, palmatine, nonglycosidegiloningilosterol, tembertarine, choline and tinosporin has been reported from the stem part of the T. Cordifolia [3-6].

Pharmacological Activities of Tinospora Cordifolia

Ayurvedic medicine, Giloy is having a very good impact on reproductive system, blood and fat. Although it has been used to treat a variety of conditions, from gout to jaundice tuberculosis, only a few of these uses are currently supported by scientific evidence.

1. Inhibitory Effect of a Polysaccharide on Metastasis

Administration of the polysaccharide fraction from Tinosporacordifolia was found to be very effective in reducing the metastatic potential of melanoma cells. Therewas a 72% inhibition in the metastases formation in tumors of syngeneic mice, when the drug was administered simultaneously with tumors challenge. Biochemical parameters such as lung collagen, hydroxyproline, hexosamine, and uronic acids that are markers of neoplastic development were reduced significantly in the treated animals compared with the untreated control animals. The treatment could also reduce serum glutamyltransferase and sialic acid levels as compared to the control animals. [7]

2. Radiation Therapy

A study published in "Evidence-Based Complementary and Alternative Medicine" demonstrated that giloy may help prevent negative side effects of radiation treatment. The experiment, which was conducted on adult male mice, focused on the damaging testicular effects of...
radiation treatment in males. Male mice who underwent treatment with giloy and were exposed to radiation suffered from fewer testicular lesions and other negative side effects than those who were not treated with giloy. These studies suggest that giloy may be effective in preventing infertility and related problems in men who undergo radiation treatment. [8]

3. Against AIDS

Giloy may also be beneficial for people with HIV and other autoimmune disorders. Giloy's traditional use as an immunomodulator led researchers to study its effects on patients with HIV. In a study published in the "Indian Journal of Pharmacology," 60 percent of HIV patients who received giloy treatment reported a decrease in disease-related symptoms, as opposed to only 20 percent who received placebo treatment. This study suggests that giloy may improve the immune systems of patients with HIV and other immune disorders, while also alleviating common side effects of these conditions. [9]

4. Anti Diabetic Activity

The extract of T. cordifoliatestem ameliorates the derangements in lipid metabolism caused by diabetes mellitus in streptozotocin induced diabetic rats. [13] The oral administration of various extracts (hexane, ethyl acetate, and methanol) of T. cordifolia stem was found to have potent antidiabetic property by reducing blood sugar levels in streptozotocin induced diabetic rats at a dose of 250 mg/kg. [14] The polyherbal formulation, Dihar containing eight different herbs viz., Syzygium cumini, Momordica charantia, Emblica officinalis, Gymnemasyvestre, Enicostemma littorale, Azadirachta indica, T. cordifolia, and Curcuma longa significantly reduces level of lipid peroxidation and increases activity of antioxidant enzymes in streptozotocin induced diabetic rats. [12] The ethylacetate, dichloromethane, chloroform and hexane extracts of T. cordifoliatestem were evaluated for alpha glucosidase inhibitory activity and resulting that the dichloromethane extract was the most effective i.e. 100% inhibition of the alpha glucosidase than others. [15] The ethanol extract of T. cordifoliademonstrates an androgenic activity. [16] Saponarin isolated from leaf extract of T. cordifolia showed hypoglycemic activity at doses of 20-80 mg/kg. [17] The hydro alcoholic and chloroform extracts of T. cordifolia stem demonstrates significant antidiabetic property at 250 and 500 mg/kg dose dependently in alloxaninduced diabetic rats. Pharmacological studies have proven in vivo antidiabetic potential of various extracts of T. cordifolia. It has been reported to mediate its antidiabetic potential through myriad of biologically active phytoconstituents isolated from different parts of plant, including alkaloids, tannins, cardiac glycosides, flavonoids, saponins and steroids. These compoundshave been reported to encompass different target activities in diabetic conditions, thus enabling the potential application in experimental and clinical research. Kannadhasan R and Venkataraman S study reported that 30 days treatment of Sedimental extract of Tinosporacordifolia (SETc) (1000 mg/kg/p.o), ondiabetic subjects was proven for its efficacy and clearly establishes the antidiabetic activity with antiobese bodybuilt. The Ethanolic extract of Tinosporacordifolia leaves in different dosages (200 and 400 mg/kg b.w.) administered orally for 10 days and 30 days instreptozotocin diabetic albino rats. It is clearly shown that TC has significant antidiabetic activity in diabetic animals and has an efficacy of 50% to 70% compared toinsulin. Borapetoside C isolated from Tinosporacrispa (5 mg/kg, i.p.) attenuated the elevated plasmaglucose in diabetic mice, increased glucose utilization, delayed the development of insulin resistance and thenenhanced insulin sensitivity. The activation of insulininduced IR-Akt-GLUT2 expression in liver and thenenhancement of insulin sensitivity may have contributed to the hypoglycemic action of borapetoside C. The isoquinoline alkaloid rich fraction from stem, including, palmatine, jatrorrhizine, and magnoflorine have been reported for insulin-mimicking and insulin-releasing effects both in vitro and in vivo. In Ehrlichascites tumor cells model, water, ethanol and methanolextracts of the herb showed glucose uptake-stimulatory activity. The protective effects of Tinosporacordifoliaroot extract were reported in presence of higher level of antioxidant molecules and enzymes. Tinosporacordifoliaroot extract has been shown to significantly counterbalance the diabetes associated oxidative stress in the maternal liver by lowering the levels of malondialdehyde and reactive oxygen species and the increased levels of glutathione and total thiols. Oral treatment of Tinosporacordifolia (100 and 200 mg/kg body weight) for 14 days mediates its antidiabetic potential through mitigating [10, 11]
5. Anticancer Activity
The active principles from T. cordifolia enhance host immune system by increasing immunoglobulin and blood leukocyte levels and by the stimulation of stem cell proliferation. It has the ability to reduce solid tumour volume by 58.8%, which is comparable to cyclophosphamide, a known chemotherapeutic agent. Activity, this activity is mostly shown in animal models. The extraction of alkaloid palmatine from Tinosporacordifoliaby using response surface methodology (RSM) clearly indicate the anticancer potential in 7,12-dimethylbenz(a)anthracene DMBA induced skin cancer model in mice. A single application of Tinosporacordifoliain extract at a dose of 200, 400 and 600 mg/kg dry weight, 24 hrs prior the i.p. administration of cyclophosphamide (at the 50 mg/kg), significantly prevented the micronucleus formation in bone marrow of mice, in a dose dependent manner. C57 Bl mice when received 50% methanolic extract of Tinosporacordifoliata a dose 750 mg/kg body weight for 30 days showed increase in life span and tumor size was significantly reduced as compared to control .Mishra R et al study investigated the anti-brain cancer potential of 50% ethanolic extract of Tinosporacordifolia (TCE) using C6 glioma cells. TCE significantly reduced cell proliferation in doses dependent manner and induced differentiation in C6 glioma cells . ManjuBala et al study evaluated eight secondary metabolites from Tinosporacordifoliain against four different human cancer cell lines, KB (human oral squamous carcinoma), CHOK-1 (hamster ovary), HT-29 (human colon cancer) and SiHa (human cervical cancer) and murine primary cells respectively. All extracts and fractions were active against KB and CHOK-1 cells whereas among the puremolecules palmatine was found to be active against KB and HT-29; tincordiside against KB and CHOK-1; yangambin against KB cells . Two molecules from hexane and methanol fractions (T1 and T2) from theplant Tinosporacordifoliashow that in MCF-7 cells, T1 treatment significantly suppressed the proliferation, migration and invasion of MCF-7 cells when compared to that of T2. Epithelial–mesenchymal transition related genes, Twist and Snail, were downregulated by T1 with increased transcription of E-cadherin [18, 19] These immunostimulating properties can be used in the prevention of tumour mediated immunosuppression adjuvance could be a drug choice for various cancers.

6. Anti Allergic Activity
Tinosporacordifoliahas been studied for its anti allergic effect. It was found that T cordifoliaproduced significant relief from sneezing, nasal discharge, nasal obstruction, and nasal pruritus compared with placebo with consistent improvements on examination of the nasal smears and nasal mucosa. [20]

7. As an Immunomodulator and against Hepatic Ameobiasis
The activity of a crude extract formulation was evaluated in experimental amoebic liver abscess in golden hamsters and in immunomodulation studies by Youvraj R Sohniet al. The formulation comprises the following five plants Berberis aristata, Tinospora cordifolia, Zingiber officinale, Boerhavia diffusa, and Tinospora cordifoliab. The formulation had a maximum cure rate of 73% at a dose of 800 mg/kg/day in hepatic amoebiosis reducing the average degree of infection (ADI) to 1.3 as compared to 4.2 for sham treated controls. In immunomodulation studies, humoral immunity was enhanced as evidenced by the haemagglutination titre. The T-cell counts remained unaffected in the animals treated with the formulation but cell-mediated immune response was stimulated as the leukocyte migration inhibition (LMI) tests. [21]

8. Anti-inflammatory Activity
A study was conducted by Siddalingappam C M et al. It has been observed that Tinosporacordifoliashowed significant increase in the reaction time (pain threshold) in doses of 100 mg/kg, 200 mg/kg, 100 mg/kg with 5 mg/kg of diclofenac after 30, 60 and 90 minutes of administration. Tinosporacordifoliaris well known for its immunomodulatory response. Active compounds like hydroxymustakone, N-methyl-2-pyrroliodone, Nformylannonain, cordifolioside A, magnoflorine, tincordiside and syringin has been reported to have potential immunomodulatory and cytoprotective effects . VaibhavAher et al study confirms the immunomodulatory activity of Tinosporacordifoliaethanolic extract (100 mg/Kg/p.o.) stem through altering the concentration of antioxidant enzymes, increasing T and B cells and antibody which play an important role in immunity, enhancing the concentration of melatonin in pineal gland and increasing the level of cytokines like IL-2, IL-10 and TNF-α which plays an important role in immunity . In the same above
Aqueous has also been shown to have immunomodulatory action on interleukin levels in scabies. Tinospora cordifolia extract has been reported to influence the cytokine production, mitogenicity, stimulation and activation of immune effector cells. Polymorphonuclear leucocytes (PMN) cells are an important component of the host defence system. Extracts of Tinospora cordifolia were able to stimulate the PMN cells for phagocytosis of added Candida cellsthrough an in vitro slide method of phagocytosis. Oral administration of T. cordifolia alcoholic extract (100 mg/kg, p. o) was found to have distinct increase in footpad thickness and also significant increase in the WBC counts and bone marrow cells significantly indicating stimulatory effect on haemopoietic system, it shows potent immunomodulatory action. Bharti Umretia et al. study results suggest that Guduchi Ghana (concentrated form of aqueous extract of Guduchi prepared by classical method) was found to possess significant immunomodulatory action on immune system. A randomized, controlled, parallel, pilot clinical study demonstrated that the formulated Tinospora lotion for Interleukin-1, Interleukin-6 and Interleukin-8 using blood serum samples, down regulation of Interleukin 1, 6, and 8 levels in scabies infection inhibits hyperkeratosis and infiltration of inflammatory cells into scabetic lesion. The modulation effect of the Tinospora lotion on Interleukin levels reinforces its anti-scabies activity. [22]

9. Antioxidant Activity
Anilakumar K R et al. has studied the in-vitro antioxidant activity of Tinospora cordifolia. It has been observed that Tinospora cordifolia extract possesses excellent antioxidant activity in methanol, ethanol and water extracts. The observed high antioxidant activities of the extracts indicate the potential of the stem as a source of natural antioxidants with nutraceuticals to reduce oxidative stress with consequent health benefits. The Tinospora cordifolia extract in food systems as an antioxidant is probably in biological systems as a nutraceutical. Methanolic, ethanolic and water extracts of Tinospora cordifolia show significant antioxidant potential compared to other solvents and also possess metal chelation and reducing power activity. VSivakumar et al. study results suggest that Tinospora cordifolia methanol extracts administered orally increased the erythrocytes membrane lipid peroxide and catalase activity. It also decreased the activities of superoxide dismutase, glutathione peroxidase in allloxan-induced diabetic rats. Tinospora cordifolia has the ability to scavenge free radicals generated during aflatoxicosis. Tinospora cordifolia showed protection against aflatoxin-induced nephrotoxicity due to the presence of alkaloids such as choline, tinosporin, isocolumbium, palmatine, tetrahydropalmatine, and magnoflorine. Neha Upadhyay et al. study results suggest that Tinospora cordifolia bark ethanol extracts showed the highest free radical scavenging activity compared to the methanol extracts and also ethanol extracts had the highest phenolic content. The administration of ethanolic extract of Tinospora cordifolia (EEETC) in N-nitrosodiethylamine (DEN) induced liver cancer in male Wister albino rats reverted the lipid peroxidation (LPO) levels, enzymic and nonenzymic antioxidants to near normal. Essential oil isolated from leaf of Tinospora cordifolia (Willd.) was shown strong 2,2- [23]

10. Antiulcer Activity
D. N. K. Sarma et al. has studied the antiulcer activity by using the ethanolic extracts of the roots of T. cordifolia and was observed that it induces a marked protective action against an 8 h restraint stress induced ulcerization, which is comparable to that of diazepam. [24]

11. Wound Healing Activity
Umesh Jain et al. has observed that the methanolic extract possesses significant wound healing promoting activity of Tinospora cordifolia. The study suggested that the methanolic extract of Tinospora cordifolia possesses better wound healing potency, which was evident by the increased rate of wound contraction; reduction in the period of epithelialization, increase in collagen deposition and increase in tensile strength in granulation tissue. [25]

12. Mental Disorder
The whole plant and the juice of the leaves are traditionally used in various mental disorders. This is regarded as one of the best psychotropic drugs in India. [26]

13. Effect on Memory
T. cordifolia has also been shown to enhance cognition (learning and memory) in normal rats and reverse cyclosporine-induced memory
deficit. Both the alcoholic and aqueous extracts of T. cordifoliaproduced a decrease in learning scores in Hebb William maze and retention memory, indicating enhancement of learning and memory. [27]

14. Against Dengue
The capsule developed from giloy is useful in the treatment of Dengue. It is very much useful in Ayurvedic treatment. [28]

15. Trace Element Studies
Traditionally, Tinosporacordifoliapossessed medicinal plant in India for curing ailments ranging from common cold, skin diseases, and dental infections to major disorders like diabetes, hypertension, jaundice, rheumatism, etc. Tounderstand and correlate their medicinal use, trace element studies on the aqueous extract of these medicinal plants have been carried out using particle-induced X-ray emission technique. A 2-MeV proton beam was used to identify and characterize major and minor elements namely Cl, K, Ca, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Br, and Sr in them. The very high concentrations of Cl, K, and Ca in all the leaf samples, appreciable levels of Mn and high Zn content in T. cordifolia. [7]

16. Uses and Benefits of Guduchi
All parts of guduchi plant are used for various medicinal purposes. The plant oil is effective in reducing pain and anemia and in gout and skin diseases. The herb accords longevity, enhances memory, improves health, and bestows youth, betters complexion, voice, energy and luster of the skin. It is helpful in treating digestive ailments such as hyperacidity, colitis, worm infestations, loss of appetite, abdominal pain, excessive thirst, and vomiting and even liver disorders like hepatitis. Fresh juice of guduchi, when mixed with rock candy, speeds up the recovery in hepatitis patients. It helps in remediying ailments like rakta pitta, anemia, cardiac debility, diabetes, sexual debility and splenic disorders. The starch of the plant serves as a household remedy for chronic fever, relieves burning sensation and increases energy and appetite. The decoction of guduchi, mixed with nimba and vasa, eases the itching and oozing. It benefits general weakness, dyspepsia, impotency, dysentery, secondary syphilis, tuberculosis, jaundice, constipation, leprosy, general debility, cutaneous rashes and condylomata. Guduchi helps in getting rid of renal calculi and reduces blood urea level. The decoction of guduchi and sunthi is a good combination for treating gout and rheumatic disorders. Guduchi juice, when taken with cow’s milk or lodhra, is ineffective in combating leucorrhoea. The juice is mixed with cumin seeds and consumed to reduce the burning sensation caused due to pitta. The root of guduchi is astringly emetic and used for bowel obstruction.

17. Caution
Diabetic patients are advised to use guduchi with caution, since it can lower blood sugar levels. In case you are about to undergo a surgery, stop consuming guduchi two weeks beforehand, since it can interfere with blood sugar control during the surgery. It is better to avoid guduchi during pregnancy and breastfeeding. [29]

18. Uses under Siddha System of Medicines
For Diabetes, the samoolam or the whole plant is crushed and juice is extracted. 2 to 3 ounce of this juice is given 3 times daily before food and it is a very effective remedy to control the glucose level. The leaves are baked in fire and applied externally over the ulcers. The decoction prepared by the samoolam is an effective remedy for fever. For better results, parpadakam, chandanam, chukku, koraikizhangucan be used for preparation of this decoction. An effective Siddha preparation called Seenthilsarkarai or Seenthiluppu is a very effective remedy for venereal diseases, diabetes, skin diseases, splenomegally, jaundice, cough etc. Seethilleghyam is an effective remedy for suram(fever), diarrhoea, venereal diseases etc. The juice of this plant is recommended daily in the case of AIDS. Research work on this plant has proved that it increases the immunity and defence mechanism against the retro virus and increases the lifespan of the patient. For rheumatic complaints like Rheumatoid arthritis, 20 to 30 ml of the juice of this plant is advised twice daily. Seenthilchoornam and Seethiluppu is found to bring excellent results in the conditions like chronic skin ailments, bone disorders and infertility. [30]

II. CONCLUSION
This is really a miraculous herb having the choice to be used in each and every ailments. Giloy is not approved by the Federal Drug Administration, and like other herbal treatments as well as medications, it may produce side effects such as constipation. So a further study is required along with the clinical trials to proof the benefits of
th is herb. Additionally, a person should consult his/her doctor before using giloy if having any health problem or if pregnant or breastfeeding.

The present study provides valuable information regarding the identification and authentication of the plant T. cordifolia along with the development of the solid oral dosage form with improved formulation parameters. Antioxidant rich plants serve as source of nutraceuticals that alleviate the oxidative stress and therefore prevent or reduce the onset of degenerative diseases. Therefore antioxidant activity of prepared formulation was evaluated by DPPH free radicals scavenging assay. Antibacterial activity of the formulation was performed against E. coli and B. subtilis which clearly claimed its effects against several infections, inflammations and several other therapeutic benefits for human health. The present study justifies the use of prepared formulation of T. cordifolia tablet in treatment of various infectious diseases and as a source of nutraceuticals in order to reduce oxidative stress with consequent health benefits. So further work could be done for the isolation and purification of important compounds from this plant which will allow the scientific community to utilise as an accessible alternative for the production of synthetic antibiotics. It shows many pharmacological activities as well. Hence this provides us a great scope of investigation regarding future prospects also.

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