A review on Extraction methods and Formulation process of *Tinospora Cordifolia* (giloy tablet)

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***Abstract*-Tinospora cordifolia (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 extraction techniques and formulation process of 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 extraction process. Formulation process includes wet granulation as well as Dry granulation. This review consists of advantages and limitations of extraction techniques and formulation process.**

Keywords- Tinospora cordifolia, giloy, extraction techniques, formulation process.

INTRODUCTION

Tinosporacordifolia also called Amrita, Giloy, Guduchi is widely used in Ayurvedic system of medicine "Rasayanas" to the immune system and the body resistance against infections [1]. It is a large, glabrous, deciduous climbing shrub belonging to family Menispermaceae is widely used in folk and Ayurvedicsystem of medicine it is referred as one of the most versatile rejuvenating herbs. The species are widely distributed in India, Malaysia, Indonesia and Thailand. The Hindi name of the plant is Giloy, a Hindu mythological term that cites to heavenly elixir used by Celestial beings to stay off the aging and to stay young forever [2]. The stem of T. cordifolia is succulent with long fuliform fleshy aerial roots from the branches. The bark is creamy whio grey, deeply left rosette like lenticels. The large numbers of compounds have been isolated. Tinospora cordifolia. Flowers are yellow, growing in clusters from nodes. Fruits are drupes, turning red when ripe [3]In modern medicine it is used for the treatment of general weakness, fever, dyspepsia, dysentery,gonorrhoea, urinary diseases, viral hepatitis and anemia. More recently the [4]

EVALUATION PARAMETERSEXTRACTION PROCESS OF GILOY TABLET

- Fresh parts of Tinosporacordifolia leaves, stem and aerial roots were collected.
- The materials were washed thoroughly 2-3 times with running tap water, and then air dried under shade after complete shade drying.
- Dried material was grinded in mixer and the powder was kept in small plastic bags with paper labelling. Assembly is arranged and thimble is prepared
- The 10 grams of air-dried powdered drug is extracted with Hexane for 3 days, then extract solution was collected and concentrated under vacuum using Rota-vapour.Then the plant material is againcollected and air dried. When it is completely dried it is again packed back in the thimble. Same method is repeated for chloroform, alcohol, and water.
- Finally, the dried extract is collected in glass vials.
- In this way the leaf, stem, and root of Tinosporacordifolia were extracted [8,9,10]. **For example**

- Stems of Tinosporacordifolia are dried under shade for 7–10 days and pulverized using an electric grinder.
- The dried sample was extracted with solvent of methanol and acetone in the ratio of 70: 30 (4000 mL × 4 cycles) at 40∘C for 16 hours in Soxhlet apparatus.

- They aredried under reduced pressure by using a rotary vacuum evaporator [11,12]

Soxhlet extraction:

- The 20 g powder of dried stems of Tinosporacordifolia is placed in thimble holder.
- About 300 mL of ethanol is filled in the flask.
- The thimble was clogged with cotton in order to avoid transfer of sample particles to the distillation flask.
- The drug was extracted with ethanol in Soxhlet apparatus for 3 h.
- The ethanolic extract is filtered and concentrated on Rota evaporator to give the ethanolic extract [13].
- Microwave assisted extraction: For MAE, the dried stems of Tinosporacordifolia was crushed and screened through 24 mesh sieve. Twenty gram of the powdered drug was transferred to a 500 mL conical flask. Two hundred milliliter of 80% (v/v) ethanol-water was added. The mixture was shaken well and kept for some time so that the drug absorbs the solvent. In this way the bumping of solvent was avoided and extraction was better when the flask kept in the microwave oven and treated for microwave process. The best suited combination obtained after central composite design were applied. Extraction temperature was set at 3 min and irradiation power set at 480 W. After the extraction completed, the conical flask was taken out from the oven. Sufficient quantity of solvent was added to make a solution and then filt

Microwave Assisted Extraction

- For MAE, the dried stems of Tinosporacordifolia were crushed and screened through 24 mesh sieves.
- 20g of the powdered drug is transferred to a 500 mL conical flask.

- 200ml of 80% (v/v) ethanol-water is added.
- The mixture is shaken well and kept for some time so that the drug absorbs the solvent.
- In this way the bumping of solvent is avoided and extraction is better when the flask kept in the microwave oven and

treated for microwave process [14].

- The best suited combination obtained after central composite design are applied.
- Extraction temperature is set at 3 min and irradiation power set at 480 W. After the extraction completed, the conical flask is taken out from the oven. Sufficient quantity of solvent is added to make a solution and then filtered [14]

Sequential extraction

- This method is used to extract chlorophylls, carotenoids, sugars, starch and proteins along with secondary metabolites like phenols and flavonoids from samples taken from single plant.
- Fully mature Tinosporacordifolia physiologically active leaves are collected randomly in the morning and used for extraction of leaf bio-chemicals [15

Extraction	***Method***
Step-1: Extraction of chlorophylls and carotenoids.	I. Fresh leaves are chopped in small pieces and exactly 0.1 g material was weighed and macerated in mortar and pastel with 2 ml of 90% ethyl alcohol. II. The content is centrifuged at 10000 g for 10 minutes. III. The residue was re-extracted in 1 ml of 90%ethyl alcohol for two times and centrifuged at 10000 g for 10 minutes. IV. The supernatants were pooled and made to with ethyl alcohol [15,16].

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Step-2: Extraction of soluble sugars, phenols and amino acids.	I. The residue obtained in step-1 was extracted in 2 ml of 80% ethyl alcohol in boiling water bath for 30 minutes. II. The content was cooled and centrifuged at 10000 g for 10minutes and the residue obtained was re- extracted with fresh 2 ml of 80% alcohol. III. The supernatant obtained in step-1(chlorophyll extract) and step-2 were pooled and condensed in water bath to 1-2 ml and diluted to 10 ml with distilled water and centrifuged at 10000 g for 10 minutes. IV. Supernatant obtained was used for estimation of reducing sugars, total sugars, total phenols, total flavonoids and free amino acids [15,18].

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Step-3: Extraction of starch	I. The residue obtained after step-2 was re- suspended in digestion mixture (0.65 ml of 52% perchloric acid + 0.5ml distilled water) and subjected to digestion in cold condition at 0°C in refrigerator for 30 minutes. II. After cold incubation the content was centrifuged at 10000 g for 10 minutes and supernatant was collected as source of starch. [15,18] III. The pellet is further extracted with same volume of (52 % PCA and water) and supernatants were pooled. IV. The extracted starch solution was neutralized with sodium carbonates. Final volume was made to 2.5ml with distilled water [15,18].
Step-4: Extraction of proteins	I. The residue obtained in step-3 is used for extraction of proteins. II. The residue was treated with 2.0 N solution of NaOH (1 ml) for 30 minutes and centrifuged at 10000 g for 10 minutes and supernatant is collected as a source of proteins. III. The extraction was repeated with fresh NaOH solution (1 ml) and centrifuged. IV. The supernatants were pooled and final volume was made to 2.0 ml with distilled water.

	V. The pooled supernatant was saved as source of proteins [15,21].

Procedure Wet Granulation method: -

- Tinosporacordifolia tablets can be prepared by Wet granulation Method.
- Firstly, the extract is allowed to pass through the sieve no. 20 along with lactose (90mg) and blend together in a mixing tray.
- After that wet mass is obtained by incorporation of starch solution (5%) to the dry mixture.
- The wet mass is made into dough and forced to pass through the sieve.
- The wet granules obtained are allowed to dry at the temperature of 450°C at the tray dryer for 30 minutes.
- The formed granules are dried microcrystalline Sodium (60mg), cross caramalosesodium (0.9 mg), magnesium stearate (1%) and talc (1%) were added and they are passed through the sieve and milling is done.
- The granules were ready for the compression to obtained tablets of about 500mg [5].

SOLUBILITY

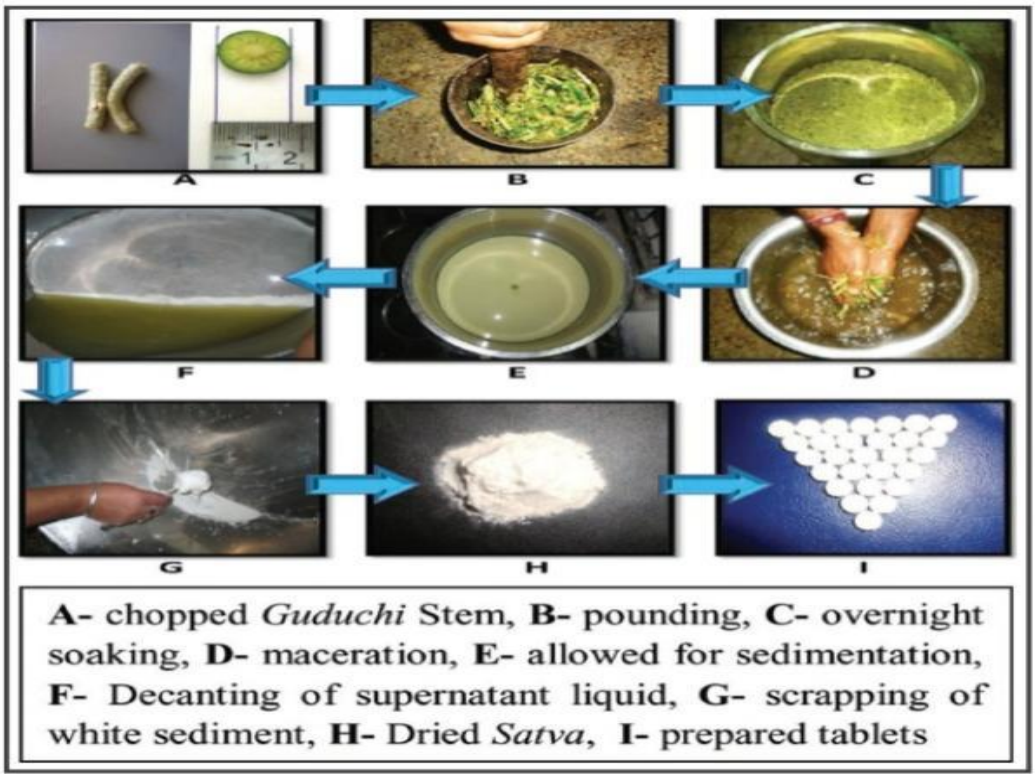
The tablets are prepared by wet granulation process using four different compositions of mucilage (1%, 2.5%, 5%, 10% w/w) alone and in combination with potato starch (10% w/w). The tablets are characterized for pre and post pressure parameters, like, angle of repose, tapped density, bulk density, Carr's index, Hausner's ratio, friability and hardness, variation of weight, disintegration time, content uniformity and studies of in vitro drug release [33,34]. It is found that release of drug from the tablet decreased (3 and 5h) with increase in concentration of mucilage (5 and 10% w/ w) and found sustained release of drug from the tablet for more than 6 hours at high concentration of mucilage combined with starch (10% w/w) [33]. Solubility of the dried mucilage was determined by shaking in different solvents [34].

Solvent Solubility

- Water Soluble (Colloidal solution)
- Hot water Soluble (Thicky solution)
- Methanol Insoluble
- Ethanol Insoluble
- Acetone Insoluble
- n- Hexane Insoluble

Dry granulation method: -

- Fresh stems of TinosporaCordifolia were collected and thoroughly washed with water to remove impurities.
- The stem was sliced into half and then cut into small pieces.
- It was crushed and mixed with distilled water in a breaker and placed on the heating mantle at 100°C for 4 hours.
- The mass was kept soaking overnight. After 12 hours the mass was filtered with muslin cloth and liquid was kept undisturbed.
- Carefully, the supernatant was decanted and collected in a separate beaker.
- Acetone was added slowly to the filtrate till precipitation is completed. The precipitate mucilage was separated and washed trice with acetone to remove the traces of water.
- The separated mucilage was spread on a glass plate and dried at 45°Cto 50°C.
- Dried mucilage was grinded and passed through sieve no 60 and was stored in air tight container [36,37].



A- chopped *Guduchi* Stem, **B-** pounding, **C-** overnight soaking, **D-** maceration, **E-** allowed for sedimentation, **F-** Decanting of supernatant liquid, **G-** scrapping of white sediment, **H-** Dried *Satva*, **I-** prepared tablets

LIMITATIONS

- Giloy is particularly famous for immunity – boosting property. However, consuming too much of it can over-stimulate your immune system which can lead to complications. So, it is best to avoid giloy if you have been diagnosed with auto-immune diseases such as multiple sclerosis lupus (system lupus erythematosus) and rheumatoid arthritis [7].
- Giloy may interfere with the blood sugar levels during or after surgery. Therefore, it is advisable to avoid Giloy at least 2 weeks before a scheduled surgery [7].
- Use Giloy or its constituents only under a doctor's supervision if you are allergic to it [7].
- Giloy may cause the immune system to become more active. Therefore, it is advisable to avoid Giloy along with immunosuppressants [7].
- Giloy may lower blood glucose level. So, it is generally advised to monitor the blood glucose if you are taking Giloy along with anti-diabetic drugs medicinal use of Giloy during pregnancy due to the lack of scientific evidence [7].

ADVANTAGES

- **Giloyfor chronic fever: -**
  Giloy has a Javarghana (antipyretic) to reduce fever [35].
- **Giloyfor dengue fever: -**
  Giloy is an antipyretic herb. It improves platelet count in dengue fever and reduces the chances of complications. Regular intake of Giloy helps to improve immunity during dengue and also for a speedy recovery. For better results boil Giloy juice with a few Tulsi leaves and drink to increase platelet count [34,35].
- **Giloyhay fever: -**
  Giloy is very useful in hay fever also known as allergic rhinitis. It reduces the symptoms like runny nose, sneezing, nasal obstruction, watering of eyes. To reduce the temperature, take ½ teaspoon of Giloy powder mix with honey and eat this before food [34,35].
- **Controls blood sugar level: -**
  In Ayurveda, Giloy is known as 'Madhunashini' which means ' destroyer of sugar'. It helps to enhance the production of insulin which ultimately controls the blood sugar levels. Giloy is also useful for diabetes complications like ulcers, kidney problems [34,35].
- **Boosts immunity: -**
  These herbs activated the immune system of our body and increase vitality in a person. Giloy juice or kadha in your diet twice a day can improve your immunity. It is full of antioxidants and helps to release toxins from the body. Giloy juice also detoxifies your skin and improve your skin. Giloy is also used for liver diseases, urinary tract infections, and heart- related issues [34,35].
- **Improvedigestion: -**
  Giloy improves digestion and reduces digestion- related problems like diarrhea, colitis, vomiting, hyperacidity, etc. [34,35].
- **Reduces stress and anxiety: -**
  Giloy is an excellent remedy to reduce mental stress and anxiety. It calms down your body. Giloy also has the power to enhance memory and cognitive function [34,35].
- **Treats arthritis and gout: -**
  Giloy contains anti-inflammatory and anti-arthritis properties which help to reduce arthritis and gout. For joint pain, consume Giloy powder with warm milk [34,35].
- **Improves eye sight: -**
  Giloy is very effective to improve eye-sight when applying topically. It is usually used in Panchakarma [34,35].
- **Improves respiratory health: -**
  Giloy has anti-inflammatory properties. Breathing problems caused by asthma can be traced to inflammation of the trachea. Giloy can help ease the inflammation to help you breathe more freely [34,35].
- **Youthfulskin: -**Free radicals speed up the ageing process. Since giloy is loaded with antioxidants, it can prevent oxidative stress and that in turn slows down the ageing of the skin. Giloy can also improve blood circulation which bestows a natural glow to the skin. [34,35].

SUMMARY

Tinosporacordifolia (Giloy) a medicinal herb used in the Indian Ayurvedic system of medicine due to their health benefits. Tinosporacordifolia also called Amrita, Giloy, Guduchiis widely used in Ayurvedic system of medicine "Rasayanas" to the immune system and the body resistance against infections. It is a large, glabrous, deciduous climbing shrub belonging to familyMenispermaceae is widely used in folk and AyurvedicSystem of medicine it is referred as one of the most versatile rejuvenating herb. The stem of T. cordifolia is succulent with long filiform fleshy aerial roots from the branches. The bark is creamy white to grey, deeply left rosette like lenticels. Flowers are yellow, growing in clusters from nodes.

Fruits are drupes, turning red when ripe. In modern medicine it is used for the treatment of general weakness, fever, dyspepsia, dysentery, gonorrhea, urinary diseases, viral hepatitis and anaemia more recently the immunomodulatory properties, antioxidant activity, antineoplastic activity, hypoglycemic activity, antipyretic activity, hepatoprotective activity, diuretic, anti-stress, antihyperglycemic, antidiabetic and anti-tuberculotic activity were evaluated.

It includes evaluation parameters which includes procedure of giloy tablet which is done by wet granulation method. The limitations states that the consuming too much of it can over-stimulate your immune system which can lead to complications. It may cause the immune system to become more active which could further increase the symptoms of autoimmune diseases. It also has limitations in allergic conditions, in pregnancy, etc.

Extraction process of giloy contains fresh parts of Tinosporacordifolia leaves, stem and aerial roots. Which includes Soxhlet extraction, Microwave assisted extraction, Sequential extraction in which extraction of chlorophylls and carotenoids, extraction of soluble sugars, phenols and amino acids, extraction of starch, extraction of proteins are done. Solubility of the dried mucilage was determined by shaking in different solvents. It is soluble in water and hot water and it is insoluble in methanol, ethanol, acetone, n-Hexane.

Advantages of giloy includes for chronic fever, for dengue fever, for hay fever, to control blood sugar level, boosts immunity, improve digestion, reduced stress and anxiety, treats arthritis and gout, improves eye-sight, improved respiratory health, youthful skin.

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