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Research Paper

Formulation And Evaluation of Sugar Free Antidiabetic Candy from Giloy Leaf Extract

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ABSTRACT

Tinospora cordifolia is an Ayurvedic herb known for its many health benefits. It is a plant that attracts much attention due to its medicinal properties. Tinospora cordifolia is widely used in the Indian system of medicine for its ability to boost immunity and treat fever, inflammation, and liver disease. The candy which is available in the market have many health effects by adding unnecessary nutrients. The research and development of this product ensures that no chemical preservatives are added and the products are effective and safe to eat. These two sweets are often combined with giloy extract and stevia to develop a product that is considered one of the best food products and also contributes to the product ratio for other sweets that can be used with supplementary food today. Desserts are a good source of energy, carbohydrates, protein, fat, fiber, total sugar and vitamin C. The end product is complete control of the food supply. Due to its nutritional value, this product is especially recommended for people with diabetes

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels resulting from impaired insulin secretion, action, or both. It is a major global health concern, affecting millions of people worldwide and contributing to severe complications such as cardiovascular diseases, neuropathy, nephropathy and retinopathy. Conventional treatment methods rely on oral hypoglycemic agents and insulin

therapy, which often come with adverse effects and limitations in long-term efficacy. As a result, there is a growing interest in natural remedies, particularly medicinal plants, for their potential role in diabetes management. Among various herbal remedies, Tinospora cordifolia (Giloy) has been extensively studied for its antidiabetic activity. Traditionally used in Ayurveda, this plant possesses a range of pharmacological properties, including antioxidant, immunomodulatory and hypoglycemic effects. The bioactive compounds

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present in *T. cordifolia*, such as alkaloids, flavonoids and glycosides, contribute to its ability to enhance insulin secretion, improve glucose uptake and regulate carbohydrate metabolism. Several studies have demonstrated the efficacy of *T. cordifolia* in lowering blood glucose levels in diabetic models, making it a promising candidate for herbal-based antidiabetic formulations.[1]

Candy is a semisolid pharmaceutical preparation. Candy is delicate, delicious, treat that we all love. Herbal products have lesser side effects than synthetic one. It is a popular product consumed by children, Young and elderly alike. The major ingredient is sugar make it instant source of energy, mostly blended With variety of flavours and multi-medicinal herbs.[2]

a. HERBAL CANDY



Fig 1: classification of candy [3]

b. Advantages :

1. Herbal candies are safe medication.
2. It has good efficacy with low side effects.
3. It promotes efficient delivery system.
4. It provide unit dosage form.
5. Herbal candies enhances patient compliance.

c. Ideal properties :

1. It should have safe dosage regimen.
2. All ingredient should have compatibility to each other.
3. It should have proper stability profile.
4. It should be uniform in weight and drug content

Aim

To formulate and evaluate a sugar-free antidiabetic candy containing giloy leaf extract for providing a

convenient, palatable, and potentially effective herbal dosage form for diabetic patients.

Objectives

- To prepare giloy leaf extract suitable for incorporation into candy formulation.
- To formulate sugar-free antidiabetic candy using giloy leaf extract and suitable sugar substitutes such as stevia or other non-nutritive sweeteners.
- To develop a stable and palatable candy formulation with acceptable taste, texture, color, and appearance.
- To optimize the concentration of giloy extract and excipients for effective formulation.



- To evaluate the antidiabetic potential of the formulation based on the known hypoglycemic activity of giloy extract.
- To study the dissolution or release profile of active constituents from the candy formulation.
- To evaluate the stability of the prepared candy under different storage conditions.
- To develop a patient-friendly herbal dosage form that improves compliance in diabetic patients.
- To prepare a cost-effective and safe herbal candy with minimal side effects compared to conventional sugar-containing confectionery products.
- To standardize the formulation process for future large-scale production of sugar-free herbal antidiabetic candy.

LITERATURE REVIEW

Author & Review	Study Focus	Key findings	Conclusion
Gawai K., Rathod H., Deshmukh S. (2025)	Formulation and evaluation of Giloy lozenges for antidiabetic activity	Giloy-based lozenges showed acceptable physical properties and potential antidiabetic effects due to the presence of bioactive phytoconstituents.	Giloy can be effectively formulated into patient-friendly dosage forms for diabetes management.
Gupta A., Gupta P., Bajpai G. (2024)	Pharmacological paradigms of <i>Tinospora cordifolia</i> (Giloy)	Reported antidiabetic, antioxidant, anti-inflammatory, immunomodulatory, and hepatoprotective activities of Giloy.	Giloy is a promising medicinal herb with multiple therapeutic applications, especially in diabetes.
Phad S.H. et al. (2024)	Formulation and evaluation of herbal candy	Herbal candy showed good organoleptic properties, stability, and patient acceptability.	Herbal candies can serve as effective alternative dosage forms for delivering medicinal herbs.
Singh A. (2024)	Medicinal applications of <i>Tinospora cordifolia</i>	Identified various phytochemicals responsible for antidiabetic and antioxidant activities.	Giloy possesses significant therapeutic potential for chronic diseases including diabetes.
Panwar R. et al. (2023)	Review on <i>Tinospora cordifolia</i> and its medicinal uses	Discussed phytochemical constituents such as alkaloids, glycosides, and diterpenoids contributing to therapeutic effects.	Scientific evidence supports the traditional use of Giloy in healthcare.
Bisht A., Gusain S., Patil S.M. (2023)	Multipurpose uses of Giloy	Highlighted antidiabetic, antimicrobial, antipyretic, and immune-boosting properties of Giloy.	Giloy is a versatile medicinal plant with broad pharmacological applications.
Danahy A. (2021)	Nutritional benefits, advantages, and limitations of Giloy	Summarized available evidence regarding Giloy's health benefits, including blood glucose regulation and immune support.	Giloy may be beneficial when used appropriately, but further clinical studies are required.



Singh R. (2020)	Phytochemistry and pharmacological activity of Giloy	Reported the presence of alkaloids, glycosides, steroids, and polysaccharides responsible for therapeutic effects.	The phytochemical richness of Giloy contributes to its medicinal value and antidiabetic potential.
Siddiqui S. et al. (2025)	Use of Tinospora cordifolia in food industry and value-added products	Demonstrated the potential incorporation of Giloy into functional foods and nutraceutical products.	Giloy can be utilized in innovative food formulations such as sugar-free candies.
IJFMR (2024)	Herbal formulations for therapeutic applications	Discussed the development of herbal dosage forms with improved patient compliance and therapeutic efficacy.	Novel herbal formulations can improve acceptance and effectiveness of plant-based therapies.

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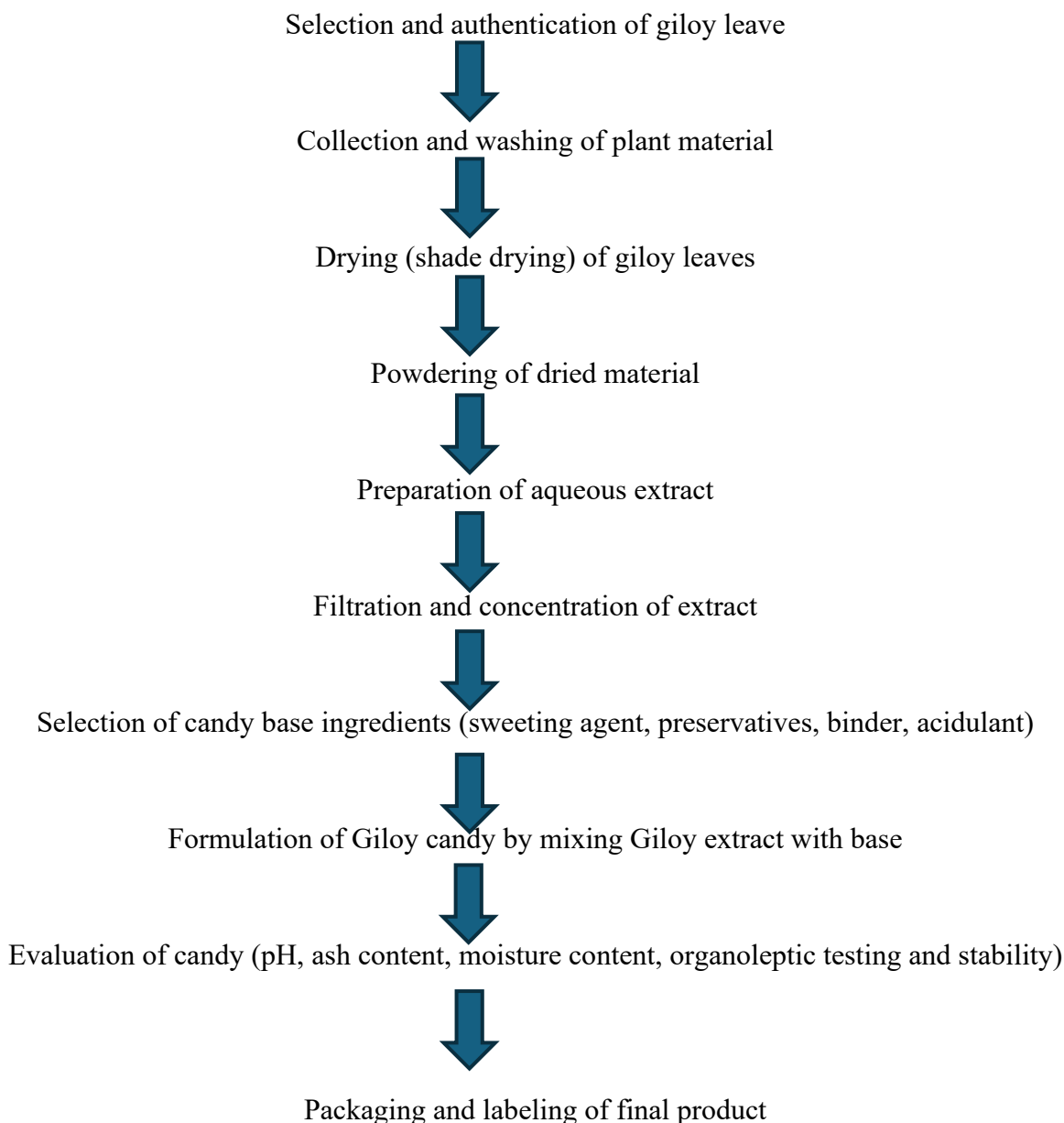
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MULTIPURPOSE USES OF GILOY Aman
Bisht*, Surendra Gusain and S. M. Patil Shree Dev
Bhoomi Institute of Education Science and

1) Plan of work



2) Plant profile [8][9]





Fig 2: Giloy leaf

- Synonyms: *Tinospora cordifolia* L. , Guduchi , Giloy leaf
- Family: Menispermaceae
- Different taxonomic ranks in the biological classification system
- Kingdom: Plantae
- Division: Magnoliophyta
- Class: Magnoliophyta
- Order: Ranunculales
- Menispermaceae
- Genus: *Tinospora*
- Phyto-chemicals:

Tinospora cordifolia contains diverse phytochemicals, including alkaloids, phytosterols, glycosides, tinosporide, and various other phytochemicals.



Fig 3: Morphology of giloy plant [6]

a. Plant description

Tinospora, a large deciduous, glabrous perennial plant, is extensively spread throughout India, especially in the tropical parts up to 1.2 km above sea level. It is found in neighboring countries such as China, Sri Lanka, Bangladesh, Pakistan, and Burma. *Tinospora* plants are mostly grown in warm climates. *Tinospora* prefers medium-black or red soil for its cultivation. It can also be successfully grown in a large variety of soils, ranging from sandy to clay loam. However, the soil should be well drained with sufficient moisture and rich with organic matter for its growth.

T. cordifolia is commonly known as the Guduchi, Giloy, Amrita, and heart-leaved moonseed plant. It is supposed to be the ambrosia of God Indra, considered a holy liquid. Another species of *Tinospora*, *T. crispa*, a small herb, locally known as Faridbel, is a woody, lofty and entirely glabrous climber. This widely grows herb is found in temperate as well as tropical region of India. Third species, *T. sinensis/malabarica* also known as Malabar gulbel, have giant deciduous climber, shining light colored stem, long orbicular-cordate leaves larger than *T. cordifolia*, dioecious flowers, and aerial roots from branches [4]

b. MORPHOLOGICAL DESCRIPTION:



Fig 4: Morphology of giloy plant [7]

TC is a huge deciduous, extensively spreading climbing shrub within several coiling branches. Many parts of TC have the following type of morphology.

✓ **Stem-**

The stem of this plant is rather succulent with long, filiform, fleshy, and climbing in nature. Aerial roots arise from the branches. The bark is creamy white followed by grey in colour and deeply left spirally.

✓ **Root-**

The Aerial roots of TC are present, these aerial roots are characterized by tetra to penta-arch primary structure. The cortex of the root is divided into the outer thick walled and inner parenchymatous zone

✓ **Leaves-**

Leaves of this plant are simple, alternate, ex-Lamina is ovate, 10-20 cm long, 7 nerved, and deeply cordate at the base and membranous.

✓ **Flowers-**

Flowers are unisexual, racemes, greenish yellow it appears when the plant is leafless. Male flowers are clustered and female flowers exist in a solitary inflorescence. Sepals are 6 in 2 series of 3 each. Outer ones are smaller than the inner sepals. Petals are also 6, smaller than sepals, free and membranous. Flowering occurs from March to June.

✓ **Fruit-**

They are orange-red in colour, fleshy, aggregate, and ovoid, smooth, drupelets on a thick stalk with subterminal style scars. Fruits develop during winter.

✓ **Seed-**

The curved seed has been reported in this species. Hence this family is named as a moonseed **family**. The seeds are curved in shape, the embryo also turned in to curve shape automatically. Moreover, the endocarp is variously ornamented and provides important taxonomic characters.[5]

c. THERAPEUTIC USES

➤ **Anti-allergic**

An herb called Giloy has anti-inflammatory, allergy, and Anti-histaminic properties. It helps in the treatment of Asthma, allergies, and skin diseases like eczema & Psoriasis. Additionally, it works well to treat flu, colds, And fever.[10]

➤ **Immune booster**

-Giloy is utilized to improve or support invulnerability". It contains several cancer prevention agents that battle Free extremists, keep your cells solid, and dispose of Sicknesses.[10]

➤ **Metabolism**

Giloy is particularly helpful in treating bowel-related conditions and enhancing digestion.

For best effects, combine Giloy powder with some amla, or use it in combination with jaggery to relieve constipation[10]

➤ **Treat hyperglycemia**

Giloy is likewise a hypoglycaemic specialist which helps to treat via sugar. Interceding its enemy of diabetic potential has been accounted for through moderating oxidative pressure (operating system), advancing insulin emission, and restraining gluconeogenesis and glycogenolysis, consequently managing blood glucose.[10]

➤ **Anti-inflammatory**

In old texts of ayurvedic science, Tinospora powder alongside dry ginger powder is demonstrated to be powerful in the treatment of joint inflammation.

The dose of ginger is to be decreased if the individual has corrosiveness issues[10]

d. Pharmacological activities of *T. cordifolia*

In the last two decades, *T. cordifolia* has been subjected to extensive scientific investigations with pharmacological importance all over the world. There are innumerable reports available for the use of *Tinospora* plant as anti-diabetic, anti-Inflammatory, antioxidant, immunomodulatory, anticancer, anti-microbial, anti-allergic, and many others Due to phytochemical substances present



in *T. cordifolia* plant, such as alkaloids, phenolics, diterpenoid, glycosides, aliphatic compounds, and steroids, their pharmacological activities potentially target different diseases. Most of the

pharmacological studies are based on plants' crude extracts and biologically active compounds. In this section, we have highlighted the diverse pharmacological activities of *T. cordifolia*. [11]

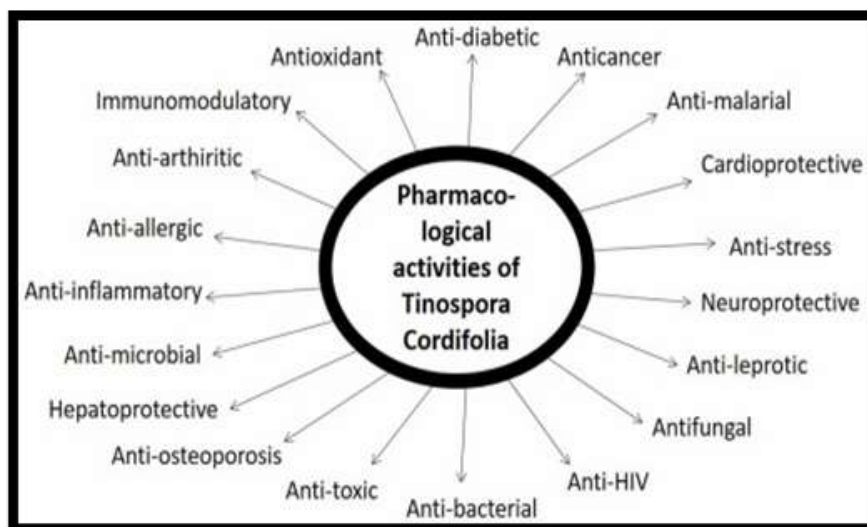


Fig 5: Pharmacological activities of giloy plant

e. Anti-diabetic potential of *T. cordifolia*.

Anti-diabetic studies

Table 1: Anti-diabetic potential of *T. cordifolia*

Extract/isolated compounds	Animal model/Cell line/Human patient	Therapeutic outcome
Methanol	Normal and alloxan rats	Increases in body weight and protein, hepatic enzyme hexokinase activity increased, glucose-6-phosphatase and significant decrease in fructose 1, 6-biphosphatase [12]
Isoquinoline alkaloid rich fraction	Normal and glucose-loaded Wistar rats	Insulin-mimicking and insulin-releasing effect in vitro and in vivo [13].
Hydoalcoholic (70% ethanol, 30% water)	High fat diet fed and streptozotocin-Sprague-Dawley rats	Inhibit gluconeogenesis and glycogenolysis and promote insulin secretion [14].
Aqueous, Alcoholic	Streptozotocin-albino rats	Increasing hepatic glycogen synthase and decreasing glycogen phosphorylase activity [15].
Aqueous and Alcoholic	streptozotocin diabetic albino rats	Increase in serum insulin levels or regeneration of pancreatic β cells [16].
Aqueous	Streptozotocin rats	Significant reduction in blood and urine glucose [17].

Hexane, ethyl acetate, methanol	Streptozotocin-rats	To decrease glycosylated hemoglobin level, reduce glucokinase and increased glucose-6-phosphatase activity, and to improve insulin secretagogue effect, insulin and C-peptide levels which shows β -cells regeneration capacity of extracts [18].
Aqueous	Alloxan induced diabetic rats	Significant decreases in blood glucose, glycosylated hemoglobin, urea, cholesterol, and increases in protein and glycogen, extract with nontoxic and well tolerated [26].
Aqueous	High-fructose diet induced diabetic Wistar rats	Improve glucose and lipid metabolism [27,28].
Ethyl acetate, dichloromethane, chloroform and hexane extracts	Normal and glucose-loaded Wistar rats	Reduce increased postprandial glucose level by inhibiting salivary and pancreatic amylase [29].
Aqueous extracted saponarin	Maltose-fed rats	Showed saponarin (apigenin-6-C-glucosyl-7-O-glucoside) with competitive inhibition on activities of alpha-glucosidase and sucrase of different origins [43].
Aqueous	Alloxan-rats	Normalized the antioxidant status of heart, brain, liver and kidney, restores the antioxidant defense [44,45].
Berberine	Clinical trial	Decrease plasma glucose and serum lipid concentrations [46].
Aqueous, Alcoholic	Streptozotocin-albino rats	Modulate renal tissue morphology and ameliorate activity of key gluconeogenic enzymes and to improve renal functions [47].
Ethanollic	Alloxan-rats	Reduce glucose level in blood [48].
Alcoholic	Alloxan-rats	Reduce glucose level in blood and urine [49].
Aqueous	Alloxan-rats	Reduce glucose level in serum [50].
Alcoholic and aqueous	Streptozotocin- mice	Amelioration of diabetic neuropathy and gastropathy [51].
Aqueous	Streptozotocin-mice	Reduce plasma glucose concentration by increasing glucose metabolism [52].
Aqueous	Alloxan-rats	Increases in body weight, total hemoglobin and hepatic hexokinase; decreases in hepatic glucose-6-

Aqueous Aqueous Aqueous, alcoholic, chloroform Aqueous Aqueous Ethanollic Alcoholic, aqueous	Alloxan-rats	phosphatase, serum acid phosphatase, alkaline phosphatase, and lactate dehydrogenase [30].
	Alloxan-rats	Showed effect similar to 1 IU/kg of insulin [31].
		Reduction in serum and tissue cholesterol, phospholipids and free fatty acids [32].
	Normal and alloxan induced diabetes in rabbits	Action similar to glibenclamide and insulin [33].
	Adrenaline induced hyperglycemia in rabbits	Significantly inhibit hyperglycemia [34].
	Alloxan-rats and rabbits	
	Fasted albino rats	Regulates glucose metabolism [35].
	Fasted albino rats	Reduce glucose level in blood [36].
		Reduce blood glucose in fasting by increasing glucose uptake and inhibition of peripheral glucose release [37].

Material and equipment✓ **Plant Material**

Fresh leaves of fresh giloy plant were collected from rural area of Kolpewadi, Ahilyanagar District

✓ **Material chart****Table 2: Material with their role**

Sr.no	Ingredient	Function
1	Giloy extract	API (Antidiabetic activity)
2	Gum acacia	Binder/ stabilizer
3	Citric acid	Flavoring agent
4	Stevia	Sugar substituent
5	Water	Vehicle

✓ **Formula chart****Table 3: Working formula**

Sr.no	Ingredient	F1	F2	F3	F4
1	Giloy extract	0.1ml	0.3ml	0.5ml	0.7ml
2	Gum acacia	500mg	1gm	1.5gm	2gm
3	Citric acid	0.2ml	0.3ml	0.4ml	0.5ml
4	Stevia	10gm	20gm	30gm	40gm
5	Water	q.s	q.s	q.s	q.s



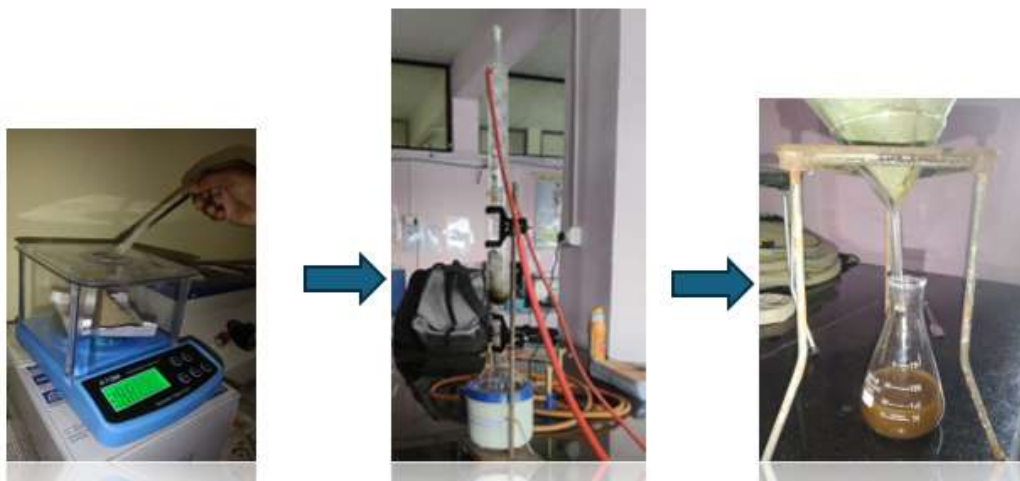
✓ **Equipment****Table 4 : Required equipments**

Sr.no	Equipment
1	Weighing balance
2	Beaker
3	Soxhlet apparatus
4	Conical flask
5	Measuring cylinder
6	Funnel
7	Mold
8	Test tube
9	Test tube holder
10	Test tube stand
11	Spatula

METHODOLOGY OF PREPARATION OF CANDY• **EXTRACTION**• **Soxhlet extraction:**

- Dry Giloy leaves and prepare coarse powder.
- The 20 g powder of dried leaves of *Tinosporacordifolia* is placed in thimble holder.
- About 200 mL of water 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 water in Soxhlet apparatus for 6-8 h.
- The aqueous extract is filtered and concentrated on Rota evaporator to give the aqueous extract[38]

• **Preparation of Gum Acacia Mucilage**

- ✓ Required quantity of purified water is taken in a clean beaker.
- ✓ Gum acacia is added slowly with continuous stirring.

- ✓ Stirring is continued until smooth and uniform mucilage is formed.
- ✓ Lumps formation should be avoided during mixing.
- ✓ The prepared mucilage gives proper consistency to the candy base.

- **Addition of Stevia**

- ✓ Stevia is used as a natural sugar substitute suitable for diabetic patients.
- ✓ Required quantity of stevia is weighed accurately.
- ✓ It is added slowly into gum acacia mucilage.
- ✓ Continuous stirring is done to ensure complete dissolution.
- ✓ Stevia provides sweetness without increasing blood sugar levels.

- **Addition of Citric Acid**

- ✓ Citric acid is weighed accurately.
- ✓ It is added slowly into the mixture.
- ✓ Continuous stirring is maintained to obtain uniform solution.
- ✓ Incorporation of Giloy Extract
- ✓ Measured quantity of concentrated giloy extract is added into prepared candy base.
- ✓ The mixture is stirred continuously for uniform distribution of extract.
- ✓ Proper mixing ensures uniform drug content in each candy.

- **Heating of Candy Mixture**

- ✓ The prepared mixture is heated gently on water bath or low flame.
- ✓ Continuous stirring is maintained throughout heating process.
- ✓ Heating helps in thickening of mixture and formation of candy consistency.

- ✓ Heating is continued until semisolid sticky mass suitable for molding is obtained.

- **Molding of Candy**

- ✓ Candy molds are cleaned properly.
- ✓ Molds are lightly lubricated using oil or butter paper to prevent sticking.
- ✓ Warm candy mass is poured carefully into molds.
- ✓ Air bubbles are removed by gentle tapping.
- ✓ The mixture is allowed to settle uniformly inside molds

- **Cooling and Solidification**

- ✓ Filled molds are kept undisturbed at room temperature.
- ✓ Cooling allows solidification and hardening of candies.
- ✓ Candies are dried for several hours to remove excess moisture.
- ✓ Proper cooling improves texture and hardness of candy.

- **Removal and Packaging**

- ✓ Solidified candies are removed carefully from molds.
- ✓ Candies are wrapped individually or packed in airtight containers.
- ✓ Packaging protects formulation from moisture and contamination.
- ✓ The prepared candies are stored in cool and dry place.



Fig 7: Weighing a sample



Fig 8: Filtration of concentrated extract

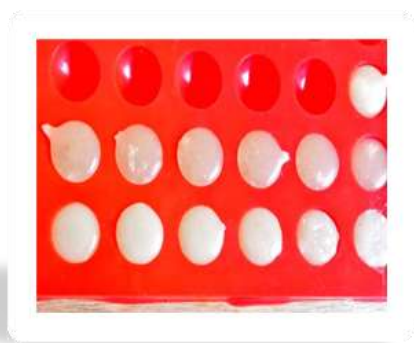


Fig 9: Molding of sample solution



Fig 10: Formulation of candy

a. Evaluation

i. Physical evaluation

1. **Colour:** The giloy candy is whitish creamy in colour.
2. **Odour:** It possesses Mild herbal odor
3. **Consistency:** It has hard consistency from inside and outside
4. **Taste:** It has sweet taste firstly then it gives sour and little bit bitter taste latter on.
5. **Texture:** It has hard texture
6. **Apperance:** hard and uniform

ii. Chemical Evaluation

• pH:

Evaluated for stability, generally in the acidic range (5-6) to prevent bacterial growth.



Fig 11: pH determination

• Ash Value:

Measures inorganic residues, ensuring purity (usually 1.2-1.5%).

• Moisture Content:

Determine moisture using hot air oven method. No moisture content in formulation it ensure the shelf life of candy.

iii. Phytochemical Screening

▪ Tests for: Alkaloids

Table 5: Alkaloid tests for Giloy extract

Test	Procedure	Observation	Interference
Mayer's Test	Take 1 mL test solution. Add few drops of Mayer's reagent.	Cream precipitate	Presence of alkaloids confirmed.



	(Potassium mercuric iodide solution)		
Wagner's Test	Take 1 mL test solution. Add few drops of Wagner's Reagent (Iodine-potassium iodide solution)	Reddish-brown precipitate	Presence of alkaloids confirmed.
Hager's Test	Take 1 mL test solution. Add few drops of Hager's Reagent (Saturated picric acid solution)	Yellow precipitate	Presence of alkaloids confirmed.
Picric acid Test	Take 1 mL test solution. Add few drops of Picric acid reagent (Saturated picric acid solution)	Yellow precipitate	Presence of alkaloids confirmed.



Fig 12: Alkaloid testing

❖ Evaluation of stability study

- Short time stability testing

Table 6: Stability determination

Time	Temperature	Observation				Stability
		F1	F2	F3	F4	
1 Week	25 ⁰ C	No change	No change	No change	No change	Stable
	35 ⁰ C	No change	No change	No change	No change	Stable
2 Week	25 ⁰ C	No change	No change	No change	No change	Stable
	35 ⁰ C	change	No change	No change	No change	F1 unstable
3 Week	25 ⁰ C	change	No change	No change	No change	F1 unstable

	35 ⁰ C	change	change	No change	Change	F1,F2,F4 unstable
4 Week	25 ⁰ C	change	change	No change	No change	F1,F2, unstable
	35 ⁰ C	change	change	No change	Change	F1,F2,F4 unstable

After the stability testing the F3 was stable than the F1, F2, and F4

RESULT AND DISCUSSION

The evaluation of the Giloy candy revealed that all four formulations showed acceptable organoleptic and physical characteristics, making them suitable for oral administration. Each batch displayed good consistency in appearance, taste, and shape,

indicating uniform formulation. Stability test confirmed the giloy candy was stable and suitable to use without microbial contamination.. Alkaloid test show the active herbal components, essential for therapeutic efficacy. The pH levels were within the acceptable range for oral use,. Overall, the results indicated that the candy were pharmaceutically acceptable and potentially effective for antidiabetic application.

Sr. no	Parameter	Formula			
1	Organoleptic evaluation	F1	F2	F3	F4
	• Colour	whitish creamy	whitish creamy	whitish creamy	whitish creamy
	• Odour	Mild herbal odor	Mild herbal odor	Mild herbal odor	Mild herbal odor
	• Taste	Sweet and little bitter	Sweet and little bitter	Sweet and little bitter	Sweet and little bitter
	• Shape	Round	Round	Round	Round
	• Appearance	hard and uniform	hard and uniform	hard and uniform	hard and uniform
2	pH	5-6	5-6	5-6	5-6
3	Consistency	Hard	Hard	Hard	Hard
4	Ash content	1.2-1.5%	1.2-1.5%	1.2-1.5%	1.2-1.5%
5	Moisture content	Yes	NO	Yes	No
6	Stability	Less stable	Less stable	Highly stable	Less stable

FUTURE PERSPECTIVE

India's medicinal plants are diverse. Despite possessing many bioactive components and being medicinal, giloy has received little scientific study. Giloy stem's potential antidiabetic and other benefits are becoming more understood, although

the mechanisms are still unclear. Commercially accessible synthetic antidiabetic medicines are used to treat diabetes. These pharmaceuticals include sulphonylureas (glibenclamide), biguanides (metformin), thiazolidinediones (pioglitazone), alpha-glucosidase



CONCLUSION

This study demonstrates the potential of *Tinospora cordifolia* (Giloy) as a viable herbal agent for antidiabetic therapy when formulated into sugar free candy. By adopting a user-friendly dosage form, the research moves toward improving long-term treatment adherence in diabetic patients who may prefer alternatives to traditional tablets or injections. The sugar free candy not only serve as a novel drug delivery system but also highlight the role of natural plant-based medicine in modern pharmaceutical design. Furthermore, the study opens avenues for Integrating such herbal dosage forms into preventive healthcare systems. However, the findings must be supplemented with advanced pharmacokinetic analysis, bioavailability testing, and clinical validation before widespread application. As interest in natural therapies grows, formulations like Giloy sugar free candy could become important adjuncts or alternatives to synthetic antidiabetic drugs.

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