



E-ISSN: 2707-2835

P-ISSN: 2707-2827

[www.pharmacognosyjournal.com](http://www.pharmacognosyjournal.com)

IJPLS 2024; 5(1): 09-16

Received: 13-11-2023

Accepted: 15-12-2023

**SK Bais**Fabtech College of Pharmacy,  
Sangola, Maharashtra, India**NS Dhavre**Fabtech College of Pharmacy,  
Sangola, Maharashtra, India**Diptee Devmare**Fabtech College of Pharmacy,  
Sangola, Maharashtra, India**Corresponding Author:****SK Bais**Fabtech College of Pharmacy,  
Sangola, Maharashtra, India

## Formulations and evaluation of antidiabetic *Tinospora cordifolia* powder

**SK Bais, NS Dhavre and Diptee Devmare**

DOI: <https://doi.org/10.33545/27072827.2024.v5.i1a.103>

### Abstract

Humanity has used medicinal plants for their therapeutic benefits ever since the dawn of civilization. For thousands of years, nature has served as a source for therapeutic substances, and an astounding number of contemporary medications have been identified from natural sources. The primary healthcare system of resource-poor areas in India has continued to rely on traditional medicine as the most accessible and reasonably priced form of treatment. *Tinospora cordifolia* is a shrub that is frequently utilised in Ayurvedic and folk medicine throughout India. Although practically all of its parts are employed in traditional medical systems, the most significant portions that are used medicinally are the leaves, stems, and roots. It is a member of the Menispermaceae family. One of the most adaptable herbs for rejuvenation, guduchi has a wide range of medicinal benefits. Guduchi's Madhu meahara (Anti-diabetic) characteristics are highly valued in Ayurveda and even in more recent scientific studies.

In the present study, GS prepared from the stem of *T. cordifolia* was evaluated for hypoglycemic and Antidiabetic. GS was powder dissolve in distilled water and administered to oral route of powder dosage form. Present review encompasses (i) in-depth information of antidiabetic potential of Guduchi and its various dosage forms from Ayurvedic view and (ii) to understand the possible mechanism of its action in combating the complex pathology of diabetes. In the current study, the hypoglycemic and anti-diabetic effects of GS made from *T. cordifolia* stem were assessed. GS was given as a powder dose form that was dissolved in distilled water and swallowed. The current review includes (i) in-depth analysis of Guduchi's antidiabetic potential and its many dosage forms from an Ayurvedic perspective, as well as (ii) an understanding of its probable mechanisms of action in addressing the intricate pathology of diabetes.

**Keywords:** *Tinospora cordifolia*, dosage forms, antidiabetic

### Introduction

Ayurveda refers to the long-standing condition known as diabetes mellitus (DM) as "Madhumeha," which is a Tridosha-predominant disease. Neglecting the disease can have significant clinical, financial, and social repercussions. Artificial antihyperglycemic drugs are being used blindly in practise. Do they actually aid those with diabetes? Alternative Ayurvedic remedies are therefore preferable to traditional anti-diabetic medications because they have fewer adverse effects and are less expensive. The World Health Organisation has furthered this claim. One of these extremely effective plants, *Tinospora cordifolia* (Willd.) Miers, sometimes known as Guduchi, has been utilised by doctors to treat diabetes since ancient times. These traditional views are currently being supported and validated by modern research. The extensive range of derived products (active, natural principles, and crude extracts) and its many dosage forms have been Ayurveda refers to the long-standing condition known as diabetes mellitus (DM) as "Madhumeha," a Tridosha. predominant disease. The disease, if neglected, has far-reaching clinical, economical, and social impacts. Synthetic anti-hyperglycaemic agents are running in practices blindly. World Health Organization has also substantiated the utilization of herbal remedies to combat diabetes <sup>[1]</sup>. Commonly known as Guduchi, is one of such highly potent herbs used since ancient times by physicians to combat diabetes. Contemporary researches are now validating and approving those classical theories. Its various dosage forms and wide array of derived products (active, natural principles and crude extracts) have been mentioned/used in traditional system of medicine. Though plentiful researches already carried out during the only scattered information pertaining to its antidiabetic activity is accessible in ayurvedic system and there

is need to assemble it. information discussing its effects and method of action is lacking. Therefore, a need was felt to compile available on the antidiabetic utility of this plant till recent, from the early begin used in Antidibetic patients. *Tinospora cordifolia* (Willd.) Miers, commonly known as Guduchi, is one of such highly potent herbs used since ancient times by physicians to combat diabetes. Contemporary researches are now validating and approving those classical theories. the cordifolious tinospora is a key medication in Indian medical systems and has been utilised in treatments for ages. The well-known Indian bitter medication is used for conditions such as fevers, diabetes, dyspepsia, jaundice, urinary tract infections, skin conditions, chronic diarrhoea, and dysentery. Additionally, it has been suggested to be helpful in the treatment of helminthiasis, leprosy, and cardiac disease. The stem's starch can be utilised to treat numerous ailments and is very nutritious and digestible [2]. The potential application of the well-known medicinal herb *Tinospora cordifolia* in contemporary medicine has been highlighted by recent scientific studies. The purpose of this review is to document the medicinal properties of *Tinospora cordifolia* and its potential prospects for the further scientific investigation for the development of effective therapeutic compounds

### *Tinospora cordifolia*

*Tinospora cordifolia* is a climbing shrub belongs to family Menispermaceae. It is commonly known as Guduchi, Amrita, Gurach, *Tinospora*. It is a large, glabrous deciduous climbing shrub. The stems are rather succulent with long filiform fleshy aerial roots form the branches. The bark is gray

brown and watery. The leaves are membranous and cordate. The flowers small and greenish yellow. This herb is found throughout tropical Asia ascending to a height of 300 mts. *Tinospora cordifolia* also called Amrita, Giloy, Guduchi is widely used in Ayurvedic system of medicine "Rasayanas" to the immune system and the body resistance against infections. Now days, the plant has more importance for research to preparing several dosage forms. because of its medicinal properties like anti-diabetic, anti-periodic, anti-spasmodic, anti-inflammatory, anti-arthritis, anti-oxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immune-modulatory and anti-neoplastic activities. *Tinospora cordifolia* comprises several diverse chemical components that might affect the body [3].



### Active constituents of the *Tinospora cordifolia*

The active constituents of the giloy plant can be extracted from many portions of the plant, such as the leaves, stems, and roots (Table 1) [4].

**Table 1:** Active constituents of *Tinospora cordifolia*

S. No.	Type of active component	Source	Compounds	Biological response
1	Alkaloids	Root and stem	Berberine, Choline, Palmatine, Tembetarine, Magnoflorine, Tinosporin, and Isocolumbin	Anticancer, Antiviral infections, Neurological Disorders, and Diabetes
2	Steroids	Stem	Beta-Sitosterol	Induce osteoporosis in patients with early inflammatory arthritis
3	Glycoside	Stem	Tinocordiside, Cordioside	Treats Parkinson's Disease and Other Neurological Disorders
4	Aliphatic compound	Whole plant	Octacosanol	Anti-inflammatory and anti-nociceptive
5	Diterpenoid	Whole plant	Furanolactone	Anti-inflammatory, Antimicrobial, Antihypertensive, Antiviral, Vasorelaxants

### Medicinal properties of *Tinospora cordifolia*

A myriad of biologically active compounds have been isolated from different parts of the plant body. These compounds have been reported to have different biological roles in disease conditions.

#### Anti-Diabetic Activity

Pharmacological studies have proven in vivo antidiabetic potential of various extracts of *T. cordifolia*. It has been reported to mediate its anti-diabetic potential through myriad of biologically active phytoconstituents isolated from different parts of plant, including alkaloids, tannins, cardiac glycosides, flavanoids, saponins and steroids. These compounds have 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 *Tinospora cordifolia* (SETc) (1000 mg/kg/p.o) on diabetic subjects was proven

for its efficacy and clearly establishes the antidiabetic activity with antiobese body built [1]. The compounds such as alkaloids, cardiac glycosides, saponins, flavonoids, tannins and steroids isolated from Guduchi possess anti-diabetic property. The stem extract of *T. cordifolia* is reported to have anti-diabetic potential by enhancing the insulin efficiency through its secretion from beta pancreatic cell and promoting various anti-diabetic pathway such as inhibiting glucose formation by enhancing glycogenesis etc. thereby decreasing the endogenous glucose [5]. Borapetoside C isolated from *Tinospora crispa* (5 mg/kg, i.p.) attenuated the elevated plasma glucose in diabetic mice, increased glucose utilization, delayed the development of insulin resistance and then enhanced insulin sensitivity. The activation of insulin-induced IR-Akt-GLUT2 expression in liver and the enhancement 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 effect both in vitro and in vivo. In Ehrlich ascites tumor cells model, water, ethanol and methanol extracts of the herb showed glucose uptake-stimulatory activity. The protective effects of *Tinospora cordifolia* root extract were reported in presence of higher levels of anti-oxidant molecules and enzymes. *Tinospora cordifolia* root 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 *Tinospora cordifolia* (100 and 200 mg/kg body weight) for 14 days mediates its anti-diabetic potential through mitigating oxidative stress, promoting insulin secretion and also by inhibiting gluconeogenesis and glycogenolysis [6]. Anti-diabetic activities are attributed to tannins, cardiac glycosides, flavonoids, saponins, alkaloids such as magnoflorine, palmetine, and jatrorrhizine, and other substances. When rats were given an aqueous extract lacking *Tinospora cordifolia* extract, glucose levels rose 21.3 percent, insulin levels rose 51.5 percent, triglycerides rose 54.12%, and the glucose insulin index rose 59.8% [4].

### Taxonomical classification of *Tinospora cordifolia*

#### A. Scientific Name

*Tinospora cordifolia*.

#### B. Family

Menispermaceae

#### C. Order

Ranunculales

#### D. Kingdom

plantae

#### E. Subkingdom

Tracheophyta-vascular plants

#### F. Super Division

Spermatophyta-vascular plants

#### G. Division

Magnoliophyta-flowering

#### H. Class

Magnolipsia-dicotyledons

#### I. Subclass

Polypeptalae-petal are free;

#### J. Tribe

Tinosporaceae

#### K. Genus

*Tinospora*

#### L. Distribution

Guduchi is distributed throughout tropical and subtropical of regions of India. It is indigenous to area of India, Srilanka, China, Myanmar, Philippines, Malaysia, Bangladesh, and South Africa.

#### M. Morphological Characteristics

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.

#### Morphology of *Tinospora cordifolia*

##### Stem

Nature's ascending and fleshy. Powder from a used fever

source makes up the stem. A stem from which starch is derived is known as giloy or guduchi. This plant has a long, filiform, fleshy, and climbing stem that is fairly succulent in appearance. The branches give rise to aerial roots [1]. The dried stem is cylindrical, elongated, and slightly twisted. The thin, paper-like outer bark is brown to greyish in tone. Sections of the stem has a wheel-like shape transversely. Circular and noticeable lenticels are present. The stem powder has a distinctive fragrance and bitter flavour and ranges in colour from creamish brown to dark brown. The stem is used to treat urinary disorders, fever, and dyspepsia [7]. The "Guduchi-satva" starch, which is extracted from the stem and utilised for a variety of purposes, is very nutritious and digestible.



#### 1) Bark

from white to grey. Both type 1 and type 2 diabetes are treated with bark. Additionally, powder dose forms made from bark are employed.

#### 2) Leaves

Leaves of this plant are similar long petiolate alternate round, pulvinate, and heart shaped also twisted partially and half way around.



#### 3) Roots

Roots are thread like aerial squarish in sometimes aerial roots are Roots are characterized tetra to penta primary structure. Roots are aerial, thread like, long filiform, threadlike, squarish, which arise from the mature branches or cut bits of stems grow downward and by continuously lengthening sometimes reach the ground [1]. Microscopic observations of aerial roots are characterized by tetra to penta-arch primary structure. However, cortex of root is divided into outer thick walled and inner parenchymatous zozon [7]. The dried aerial roots are light grey –brown or creamy white in colour, odourless and bitter taste. Starch is present throughout the parenchyma of the aerial root.

#### 4) Seeds

Seeds are curve shaped and endocarp is various provide taxonomic Properties. Seeds are white, bean shaped and curved [8]. Embryo also turned in to curve shape automatically [9].

#### Therapeutic Uses

*Tinospora cordifolia* have different constituents and used to treat various diseases. It is a multipurpose plant and its different dosage forms are used for various purpose.

#### Immunity Enhancer

Giloy is used to improve or boost immunity". It contains number of antioxidants which fight free-radicals, keep your cells healthy and get rid of diseases. Giloy helps to remove toxins and purifies blood, fights against bacteria.

#### In Chronic Fever

Giloy helps to recover fevers. Giloy is anti-pyretic drug, it can reduce signs and symptoms of several life-threatening conditions like Dengue, Swine Flu and Malaria as well". It helps to improve blood platelets in fever.

#### In Digestion

Giloy is very beneficial in improving digestion and treating bowel related issues. Giloy powder with some amla can use regularly to maximum results, or with jaggery for treating constipation.

#### Treats Diabetes

Giloy is also a hypoglycaemic agent which help to treat diabetes particularly Type 2 diabetes. It also helps to lower blood sugar. It has been reported to mediate its anti-diabetic potential through mitigating oxidative stress (OS), promoting insulin secretion and also by inhibiting gluconeogenesis and glycogenolysis, thereby regulating blood glucose. The major phytoconstituents of *Tinospora cordifolia* are alkaloids, tannins, cardiac glycosides, flavonoids, saponins, and steroids as have been reported to play an anti-diabetic role.

#### Treats Arthritis

Giloy contains anti-inflammatory and anti-arthritis properties that help treat arthritis and its several symptoms. For joint pain, the powder from giloy stem. It can be used along with ginger to treat rheumatoid arthritis. *Tinospora cordifolia* have been reported to affect the proliferation, differentiation and mineralization of bone like matrix on osteoblast model systems in vitro and hence finds potential application as an anti-osteoporotic agent.

#### Reduces Asthmatic Symptoms

Asthma causes chest tightness, shortness of breath, coughing, wheezing, et Giloy have an anti-inflammatory action and helps to reduce respiratory problems like frequent cough, cold, tonsils.

#### Improves Vision and reduces Signs of Aging

In several parts of India, Giloy plant is helps to boost up vision clarity. For this, boil giloy powder in water, let it cool down and apply over the eyelids. This plant contains anti-aging properties that help reduce dark spots, pimples, fine lines and wrinkles. It provides flawless, glowing skin of an individual.

#### Anti-HIV effects

TCE has been shown to demonstrate a decrease in the recurrent resistance of HIV virus thus improving the therapeutic outcome. Anti -HIV effects of TCE was revealed by reduction in eosinophil count, stimulation of B lymphocytes, macrophages and polymorphonuclear leucocytes and haemoglobin percentage thus, revealing its promising role of application in management of the disease [10].

#### Diabetes

Diabetes mellitus is a chronic disorder of carbohydrates, fats and protein metabolism. A defective or deficient insulin secretory response, which translates into impaired carbohydrates (glucose) use, is a characteristic feature of diabetes mellitus, as is the resulting hyperglycemias Diabetes mellitus (DM) is commonly referred to as a "sugar" and it is the most common endocrine disorder and usually occurs when there is deficiency or absence of insulin or rarely, impairment of insulin activity (insulin resistance) [11].

#### Symptoms of diabetes

- Excessive thirst Blurred vision Increase fatigue Extreme hunger Feeling tired
- Dry skin
- Burning sensation
- More infection than usual
- Slow healing of cuts and wound
- Nausea, vomiting and stomach pain some of the

Symptoms in the onset of insulin dependent diabetes. Current research spotlights the antidiabetic profile of Guduchi from Ayurvedic perspective and contemporary researches validating and approving it; which proves the herb a helping aid to prevent, reverse, or even delay the sequences of diabetes pathology. Conventional management options available are expensive and often associated with negative side effects; therefore, the use of Guduchi provides better alternative which are usually less toxic and affordable.

#### Type of diabetes

##### A. Type-1 Diabetes

is insulin dependent diabetes, diabetes is also patients/people need of insulin, This Diabetes is also called as insulindependent diabetes- mellitus/juvenile onset diabetes, Diabetes may be found to be 5-10% of diagnose case of diabetes diabetes isocure before age 30 especially for children, diabetes is pancreas cannot produce insulin. Type-1 diabetes further categorized into two i.e. Immune-mediated and idiopathic. In immune-mediated type1 diabetes pancreatic  $\beta$  cells destroying because of the presence of anti-glutamic acid decarboxylase antibodies. In this type ketoacidosis is the first manifestation which occurs in children and adolescents followed by modest hyperglycemia to severe hyperglycemia. On the other hand, idiopathic diabetes is type-1 diabetes with complete deficiency of insulin, a genetic factor and no indication of auto-immunity.

##### B. Type-2 Diabetes

Type-2 Diabetes is also called as resistance diabetes or non-insulin dependent diabetes mellitus or adult onset diabetes Diabetes maybe found to in 90-95%diagnosed case of

diabetes. Diabetes occurs at age of 40 but more common in young. Type 2 diabetes identified by some common symptoms like increased thirst, fatigue, weight loss, frequent urination, blurred vision etc. These patients generally do not require insulin therapy.

### C. Gestational Diabetes

Gestational diabetes is mainly found in pregnant women. It is developed pregnancy 2-5%. Gestational diabetes occurs in people with family history of diabetes. Diagram of diabetic person and normal person: Environmental Factors of Diabetes Viral infection Vaccination Climatic influence Stress.

### Dietary factor in early infancy

#### E. Risk Factors of Diabetes

There have been two ideas of type-1 & type-2 diabetes one is directly attack beta cell and pancreas.

Another affecting immune system of human body.

#### F. Risk Factors of type-2 diabetes

More fatty tissue you have the more resistance your cell become to insulin.

#### G. Inactivity

Less active your greater risk. Family history Age Gestational diabetes polycystic of over syndrome High blood pressure Race or ethnicity [11].

### Materials and Methods

#### Material

#### Formulation

Giloy Satva Powder Satva is termed as the Sara bhaga or essence of plant material and in this case, it is the essence of the giloy orguduchi plant obtained from maceration in water.

#### Ingredients

- *Tinospora cordifolia*

*Tinospora cordifolia* might lower blood sugar levels. Use it cautiously if you have diabetes, and monitor your blood sugar levels. The doses of your diabetes medications might need to be adjusted. *Tinospora* not only helpful for diabetic peoples but also beneficial in other diseased conditions.



- **Lemon**

There is some evidence that lemon juice can slow the conversion of carbohydrates to sugar, thereby preventing a spike in blood sugar. Even so, the effect is relatively small, and lemons have not been shown to be an effective home

remedy for either type 1 diabetes or type 2 diabetes.



- **Talcum**
  - Talc is a naturally occurring mineral that is commonly used in a wide range of industries, including the pharmaceutical industry. In pharmaceuticals, talc is used as a lubricant and diluent in tablet formulations, as well as a glidant in capsule formulations. It is also used as an excipient in topical and oral suspensions, and as a bulking agent in some powders.
  - In powder Formulation talc used as:
  - Bulking Agent: Talc provides bulk to powders, ensuring that they fill their containers completely.
  - Lubricant: Talc reduces friction between the particles in powders, making them easier to mix and preventing caking or clumping
  - Organoleptic evaluation
- Colour: whit  
Odour: odourless  
Teast: Teastless

### Methods

#### Extraction of *Tinospora cordifolia*

1. Fresh parts of *Tinospora cordifolia* leaves, stem and aerial roots were collected.
2. The materials were washed thoroughly 2-3 times with running tap water, and then air dried under shade after complete shade drying.
3. 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
4. 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 again collected 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.
5. Finally, the dried extract is collected in glass vials.
6. In this way the leaf, stem, and root of *Tinospora cordifolia* were extracted

#### Procedures

- Wash the guduchi or giloy stems, remove the outer husks.
- Cut the stems into smaller pieces of 2-3 inches length.
- Mash the stems inside the given quantity of water and allow it to settle overnight for about 10-12 hours.
- In the following morning, vigorously macerate the partially mashed giloy partially mashed giloy stems so

as to release the mushy starchy material into the liquid.

- Filter the mixture a few times through mesh no.85 (With minute sized pores) to remove any woody hard particles of the stem.
- Added glidant and flavouring agent.
- Keep the liquid aside uninterrupted for 4-5 hours so that the filtrate separates from the residue.
- Carefully remove the supernatant liquid and collect the starchy sediment onto a tray.
- Air-dry the sediment under the fan and store it in air-tight vessels for future use to form fine powder to take patients in warm water and cool water take morning.



#### Procedure

- Upto 5 kg of fresh giloy stem were taken by removing the bark and it was pounded (Crushed) in mortar and pestle.
- Then it was kept for soaking in water overnight (12 hr)
- Then the mass was macerated and kept for 1 hour and passed through Mesh150, so as to remove the impurities of stem or small particles of stem. The supernatant liquid was obtained after passing through mesh 150 and it was kept undisturbed for about 5-6 hours.
- The supernatant liquid was filtered by filter paper and carefully collected the white smooth starchysediment deposited on filter paper.
- This white and smooth starchy sediment was then kept under sunlight in lab for drying
- With this process we obtained 2.24 g of powder from 5 kg of giloy stem.
- The quantity of powder differs with the quality of stems. As the thick stem contains more starchy material whereas thin and newly evolved stem contains less extract.

#### Powder dosage form

Fine powder of guduchi take oral dosage form Provide conveniently made of administration.

#### Advantages of powder dosage form

- A powder can be dispersed in water or another liquid and more easily swallowed.
- Oral powders can be mixed with beverage or applesauce immediately before use.
- Manufacturing of powder dosage form is economic, hence, product cost is quite economic as compared to other dosage forms.
- Powders offer a lot of flexibility in compounding

solids.

- Water or another liquid can be dissolved in a powder, making it easier to swallow.
- Mixing the oral powder with a beverage or applesauce immediately before taking the supplement is highly recommended.
- Powder dosage forms are relatively inexpensive to manufacture, so the product price is quite low as compared to other forms.
- Mixing powders allow for a great deal of versatility.

#### Dis-advantages of powder

- Powders are not the dosage form of choice for drugs with unpleasant taste. This is because masking of unpleasant tastes may be a problem with this type of preparation.
- Drugs that deteriorate rapidly with exposure to atmosphere or acidic pH should not be dispensed as powders.
- If you take a drug that has an unpleasant taste, powders are not the best dosage forms. A taste that is masking an unpleasant quality may be problematic.
- As much as possible, powders should not be dispensing drugs that deteriorate rapidly in terms of exposure to the atmosphere or acidic pH. Salts of ferrous iron, for instance, oxidize easily and should not be administered as powders.
- Carrying powder is a hassle since it is bulky and heavy.
- The dispensing of deliquescent or hygroscopic drugs is not suitable for powders.

#### Precautions of when Guduchi powder dosage form

May cause the immune system to become more active which could further increase the symptoms of autoimmune diseases. Therefore, it is advisable to avoid Giloy if you are suffering from autoimmune diseases such as rheumatoid arthritis, multiple sclerosis and lupus. 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.

#### Pregnancy

Avoid medicinal use of Giloy during pregnancy due to the lack of scientific evidence.

#### Allergy

Use Giloy or its constituents only under a doctor's supervision if you are allergic to it <sup>[4]</sup>.

#### Breastfeeding

Avoid medicinal use of Giloy during breastfeeding due to the lack of scientific evidence <sup>[4]</sup>.

#### Moderate Medicine I

Giloy may cause the immune system to become more active. Therefore, it is advisable to avoid Giloy along with immunosuppressants <sup>[4]</sup>.

#### Patients with diabetic

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 <sup>[4]</sup>.

**Evaluation parameters****Bulk density**

It is the ratio of given mass of powder and its bulk volume. It is determined by transferring an accurately weighed amount of powder sample to the graduated cylinder with the aid of a funnel. The initial volume was noted. The ratio of weight of the volume it occupied was calculated.

$$\text{Bulk density} = w/v_0 \text{ g/ml}$$

Where,

W = mass of the powder

V<sub>0</sub> = untapped volume

**Tap density**

It is measured by transferring a known quantity (25g) of powder into a graduated cylinder and tapping it for a specific number of times. The initial volume was noted. The graduated cylinder was tapped continuously for a period of 10-15 min. The density can be determined as the ratio of mass of the powder to the tapped volume.

$$\text{Tapped volume} = w/v_f \text{ g/ml}$$

Where

W = mass of the powder

V<sub>f</sub> = tapped volume.

**Angle of repose**

The internal angle between the surface of the pile of powder and the horizontal surface is known as the angle of repose.

The powder is passed through funnel fixed to a burette at a height of 4 cm. A graph paper is placed below the funnel on the table. The height and the radius of the pile were measured. Angle of repose of the powder was calculated using the formula

$$\text{Angle of repose} = \tan^{-1}(h/r)$$

Where,

H = height of the pile

r = radius of the pile

**Compressibility index**

It is the propensity of the powder to be compressed. Based on the apparent bulk density and tapped density the percentage compressibility of the powder can be determined using the following formula.

$$\text{Compressibility index} = [(v_0 - v_f)/v_0] \times 100,$$

Or

$$\% \text{ compressibility} = \frac{(\text{tapped density} - \text{bulk density})}{\text{tapped density}} \times 100$$

**Hausner ratio**

It indicates the flow properties of the powder. The ratio of tapped density to the bulk density of the powder is called Hausner ratio

$$\text{Hausner ratio} = \text{Tapped density} / \text{bulk density}$$

**Determination of pH**

The powder of churna was weighed to about 5g and

immersed in 100 ml of water in a beaker. The beaker was closed with aluminum foil and left behind for 24 hours in room temperature. Later the supernatant solution was decanted into another beaker and the pH of the formulation was determined using a calibrated pH meter

**Chromatographic studies**

Chromatographic studies were done taking chloroform and methanol (9:1) as a solvent system and anisaldehyde-sulphuric acid as spraying reagent

**Results and Discussions**

Results show a statistically non-significant decrease in BSL was observed in the control at few days like 3-5 days, but significant decrease was in comparison to its initial BSL also take powder dosage form of guduchi also and control type-1 and type-2 non-significant decrease in BSL occurred at all the few day intervals in comparison to its initial BSL. Administration of powder dosage form take oral route in cool water/warm water to overnight fasted leads to a significant decrease in the blood glucose level at almost all the time intervals progressively to the end of the study.

**Evaluation Parameters of powder**

- **Angle of repose**

The angle of repose of various powder mixed blends prepared with different super disintegrates was measured by funnel method. It is the maximum angle possible between the pile and horizontal plane. It was measured by the formula:

$$\tan \theta = h/r = 0.6/3 = 0.2$$

$$\tan \theta = 0.2$$

$$\theta = \tan^{-1}(0.2) = 11.30$$

- **Bulk density**

The bulk density of various powder mixed blends prepared with different Super disintegrants was measured by graduated cylinder.

It is the ratio of mass of the blend to bulk volume. It was measured by pouring powder in measuring cylinder and measuring the volume occupied by powder.

$$\text{Bulk volume} = 7.5$$

$$\text{Bulk density} = \text{mass} / \text{Bulk volume} = 2.24 / 7.5 = 0.29$$

- **Tapped density**

The tapped density of various powder mixed blends prepared with different super disintegrates was measured by measuring cylinder.

It is the ratio of mass of the blend to tapped volume. It was measured by digital tap densitometer by measuring the volume occupied by powder after 100 standard tapping.

$$\text{Tapped volume} = 7$$

$$\text{Tapped density} = \text{mass} / \text{Tapped volume} = 2.24 / 7 = 0.32$$

- **Carr's index:**

It was measured by below formula

$$\% \text{ compressibility} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}} \times 100$$

$$= \frac{0.32 - 0.29}{0.32} \times 100$$

$$= 9.32\%$$

- **Hausner's ratio (HR)**

Hausner ratio is an indirect index of ease of powder flow.

Lower Hausner ratio (<1.25)

indicates better flow properties than higher ones (>1.25).

The hausner ratio of various powder mixed blends prepared with different super disintegrants, was calculated by using bulk density and tapped density data. It was measured by below formula

$$\begin{aligned} \text{H.R} &= \text{Tapped density/Bulk density} \\ &= 0.32/0.29 \\ &= 1.103 \end{aligned}$$

Dose – 500 mg to 1 g oce or twice a day, or before or after food, or as directed by Ayurvedic doctor <sup>[10]</sup>.

Effect on Tridosha - Balances vata and pitta

Product expires after two years of manufacturing, once after opening the container, it is better to empty it within a month.

#### ● Powder Rheometer from Texture Analyzer

Powder flow measurements were performed on texture analyzer with powder flow analyzer attachment (TAXT. Plus, Texture technologies, Scarsdale, NY). Approximately 10–15 g of material equivalent to 30 in 35 ml graduated cylinder was used. Samples consisted of unlubricated and lubricated material with 0.5% MgSt-B and MgSt-V. The sample was introduced into the sample holder by taking care not to lose any powder due to static charges or flying off. Fines were allowed to settle by resting the cylinders for 15 min. The test was done in triplicates. Change in person and day-to-day variations were evaluated as a preliminary study before beginning of this study. It was found to be user independent. Temperature and humidity of the room were within very narrow range.

#### ● Moisture Content:

Moisture content present in the powder can be determined by using following formula. This is usually carried out by using various suitable analytical methods. These methods are also suitable for determining limits.

#### Conclusion

The adaptable medicinal plant *Tinospora cordifolia* is the only known source of a wide range of chemicals with varied chemical structures. Current study focuses on the antidiabetic profile of *T. cordifolia* from an Ayurvedic perspective, and contemporary research validates and approves it; this establishes the herb as an aid in preventing, reversing, or even delaying the pathological sequences associated with diabetes. The use of Guduchi offers a better alternative because they are typically less toxic and pricey and are often expensive and associated with undesirable side effects. Even though *Tinospora cordifolia* has been successfully utilised in Ayurvedic medicine for millennia, considerable research and development work on *Tinospora cordifolia* and its products has to be done for improved commercial and therapeutic application. This review can be utilised for both additional research and clinical purpose.

#### References

1. Ghodake RL, Bagwan LR. *Guduchi* is Powder Dosage Form is used in Treatment of Diabetics Mellitus. International Journal of Recent Advances in Science & Engineering. 2021, 9(12). Available from: [www.ijraset.com](http://www.ijraset.com)
2. Reddy NM. Scholarly Academia Journal of Pharmacy. 2015;4(8):364-369.
3. Kakde V, Kamble P. Evaluation and Formulation of Gilloy Tablet (*Tinospora Cordifolia*). International

- Journal of Pharmaceutical Research and Applications. 2022, 7(4).
4. Saxena C, Rawat G. *Tinospora cordifolia* (Giloy)-Therapeutic uses and importance: A review. Current Research in Pharmaceutical Sciences; c2019.
5. Tiwari A. Review on *Guduchi*. Systematic Reviews in Pharmacy; c2018, 9(1).
6. Sharma PV. *Dhanwantari nighantu*. 1<sup>st</sup> ed. Varanasi: Chowkhamba Bharti Academy. Guduchyadi varga, 2005;1-4:16.
7. Sharma PV. *Kaideva nighantu*. 1<sup>st</sup> ed. Varanasi: Chowkhamba Orientalia. *Aushadhi varga*, Rasamruta, 2006;6:16.
8. Bharathi C, Reddy AH. Medicinal Properties of *Tinospora cordifolia*. International Journal of Scientific Research and Review. 2018 Dec;7(12):588-126.
9. Aiyer KN, Kolammal M. *Pharmacognosy of Ayurvedic Drugs*, Series 1. 1<sup>st</sup> ed. Trivandrum: The Central Research Institute; c1963.
10. Bishayi B, Roychowdhury S, Ghosh S, Sengupta M. Hepatoprotective and immunomodulatory properties of *Tinospora cordifolia* in CCl<sub>4</sub> intoxicated mature albino rats. The Journal of Toxicological Sciences. 2002;27(3):139-146.
11. Saxena C, Rawat G. *Tinospora cordifolia* (Giloy)-Therapeutic Uses and Importance. Current Research in Pharmaceutical Sciences. 2019;09(03):42-45.
12. Mehta CM. Recent patent technologies of *Tinospora cordifolia* for anti-diabetic potential. Plant Archives. 2019;19(Suppl 2):994-999.