Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
https://www.phytojournal.com
JPP 2024; 13(2): 10-17
Received: 08-12-2023
Accepted: 13-01-2024

Parvin Shaikh
Associate Professor, Sojar College of Pharmacy, Khandvi, Maharashtra, India

Manasi Lokare
Student, Sojar College of Pharmacy, Khandvi, Maharashtra, India

Mrunal Bhoge
Student, Sojar College of Pharmacy, Khandvi, Maharashtra, India

Nalina Rajmane
Student, Sojar College of Pharmacy, Khandvi, Maharashtra, India

Nandini Avadhut
Student, Sojar College of Pharmacy, Khandvi, Maharashtra, India

Nikhil Thavare
Student, Sojar College of Pharmacy, Khandvi, Maharashtra, India

Corresponding Author:
Parvin Shaikh
Associate Professor, Sojar College of Pharmacy, Khandvi, Maharashtra, India

Formulation and evaluation of antidiabetic polyherbal syrup

Parvin Shaikh, Manasi Lokare, Mrunal Bhoge, Nalina Rajmane, Nandini Avadhut and Nikhil Thavare

DOI: https://doi.org/10.22271/phyto.2024.v13.i2a.14865

Abstract
Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia and altered metabolism of carbohydrates, lipids and proteins. Diabetes mellitus is one of the common metabolic disorders acquiring around 2.8% of the world's population and is anticipated to cross 5.4% by the year 2025. Since long back herbal medicines have been the highly esteemed source of medicine therefore, they have become a growing part of modern, high-tech medicine. In view of the above aspects the present review provides profiles of plants (65 species) with hypoglycemic properties. The goal of this study was to create assess an herbal anti-diabetic Syrup. Made up of a variety of Medicinal plants thought to have anti-diabetic characteristics. The intestinal digestive enzymes alpha-glycosidase and alpha-amylase are analysis a vital role in the carbohydrate digestion. One antidiabetic therapeutic approach reduces the post pyramidal glucose level in blood by the inhibition of alpha-glycosidase and alpha-amylase enzymes. These can be an important strategy in management of blood glucose. The aim of the present study was to investigate the phytochemical bioactive compounds of the metabolic extract of Sodium guajava leaves, ethenolic extract of *Moringa oleifera* leaves, methenolic extract of *Clitoria ternatea* flowers. *M. oleifera* for long has been used as a natural anti-diabetic herb in India and other Asian countries. *Moringa oleifera* is one of the popular plants that have shown significant health benefits.

Keywords: Harbal syrup, anti-diabetic activity, *Moringa oleifera* leaves, *Psidium guajava* leaves, *Clitoria ternatea*, ethenolic extract and methenolic extract

Introduction
Diabetes mellitus, one of the most common endocrine metabolic disorders has caused significant morbidity and mortality due to micro vascular (retinopathy and nephropathy) and macro vascular (heart attack, stroke and peripheral vascular disease) complications [1]. According to World Health Organization the diabetic population is likely to increase up to 300 million or more by the year 2025 [2]. After pharmaceutical screening of some plants basing on traditional use by the herbal plant leaves powder extract are prepared to syrup against diabetes mellitus. Herbal medicine is treated as traditional medicines since they were extensively used in traditional system of medicine like Ayurveda, Sridha, Unani [3]. Diabetes mellitus is a complex and a diverse group of disorders that disturbs the metabolism of carbohydrate, fat and protein [4]. Antidiabetic consequence of *Moringa oleifera* are most of because phenol compounds and their possible capability to act as most productive agents in restrict the risk component for diabetes. Diabetes mellitus is a group of chronic metabolic disorder caused due to high blood sugar levels over a prolonged period. Diabetes caused by either the pancreas not producing enough insulin or the cells of the body not responding properly to the insulin produced.

Objective
- To reduce symptoms of hyperglycaemia and to reduce the risk of long-term complications of diabetes.
- Polyhedral formulations enhance the therapeutic action and reduce the concentrations of single herbs, thereby reducing adverse events.
- Investigate the Phyto chemical anti-diabetic activity of metabolic extract of *Psidium guajava* leaves.

The increased blood sugar levels are termed as "hyperglycemia"
The decreased blood sugar levels are termed as "hypoglycemia [5]".

Signs and Symptoms
- Weight loss.
- Polyuria (Increased urination).
- Polydipsia (Increased thirst).
- Polyphagia (Increased hunger).
- Loss of vision.
- Slow healing of wounds.
- Itchy skin.
- Fatigue [6].

Oral hypoglycemic drugs sold on the market have side effects such as gastrointestinal discomfort, weight gain, and hepatic dysfunction [7]. Therefore, it is an urgent need to find new potential agents for prevent and treat DM. Plants are known to possess a wide variety of pharmacological effects and extraordinary therapeutic possibilities. *Psidium guajava* Linn., *Moringa oleifera* leaves, are common fruit plant available in many countries having tropical and subtropical climates. Guava leaves have been used as a folk medicine or herbal tea to treat diarrhea and diabetes in India, China, Pakistan, Bangladesh, and Mexico for a long time due to lower toxicity and good therapeutic function [8-0].

Herbs
Herbs include crude plant materials such as leaves, flowers, fruits, seed, stem wood, bark, roots, rhizomes or other plant parts, which may be entire, fragmented or powdered.

Herbal preparations
Herbal preparations are the basis for finished herbal products and may include communicated or powdered herbal materials, or extracts, tinctures and fatty oils of herbal materials. They are produced by extraction, fractionation, purification, concentration or other physical or biological processes. They also include preparations made by steeping or heating herbal materials in alcoholic beverages and/or honey, or in other materials.

Herbal dosage forms
Herbal dosage forms are the physical form (liquid, solid, semi-solid) of herbal products produced from herbs, with or without excipients, in a particular formulation (such as decoctions, tablets and ointments). They are produced either from herbal materials (such as dried roots or fresh juices) or herbal preparations (such as extracts).

Post-harvest processing procedures
Raw herbs should be inspected and sorted immediately following harvest or collection. They are then subjected to a series of on-site primary processes, and in most cases, subjected to further processes at a processing facility.
The exact processing methods may differ from one herb to another, and the guidelines therefore may need to be adjusted on a case-by-case basis.

Sorting (garbling)
The sorting process serves as the first step to ensuring the purity and cleanliness of the herbs. After the bulk amount of the desired plant part has been harvested or collected, all extraneous and unwanted matter including dirt (for example, soil, dust, mud and stones), impurities (for example, insects, rotten tissues, untargeted/extraneous medicinal plant (s) and/or plant part (s)), and residual non-medicinal as well as toxic part (s) must be removed from the medicinal part (s). Depending on the herb, the process may involve procedures such as:
- Removing dirt and foreign substances.
- Discarding damaged parts.
- Peeling (to separate unwanted plant part (s) from the medicinal plant part (s) such as removing unwanted root bark from the roots or collecting stem bark from the stem).
- Sieving, trimming, singeing (to remove hairs or rootlets).
- Removal of residues of unwanted plant part (s) (for example, removing unwanted seeds from fruits and stripping leaves from stems).

Although in some cases sorting may be done by mechanical means, it is usually done by hand. Only staff who are suitably trained and equipped (for example, wearing gloves and a dust mask, etc. as appropriate) should carry out this work.

Primary processing
Washing raw herbs, especially roots, rhizomes and tubers, are usually washed with clean water and dried soon after harvest or collection. During the washing process, scraping and brushing may be necessary. It is generally recommended not to soak the herbs in water for an unnecessarily long period. Water should be changed as frequently as required. The use of water containing a low concentration of chlorine (for example, sodium hypochloride, bleach) to prevent microbial fermentatio is recommended where and when possible or practical.

Leaching
Some impurities can be removed by the action of running water over the raw herbs (Leaching). The duration of leaching has to be controlled in order to prevent excessive loss of active ingredients.

Primary cutting
Bulky raw herbs that have been harvested or collected may require primary cutting to reduce their size before transportation to the processing or manufacturing facility. Primary cutting is usually performed at or near the harvest or collection site.

Ageing
The ageing process refers to storing the herbal materials for a period of time after harvesting or collection from the field prior to use. Herbs are generally aged in the sun or in the shade, depending on the specific herbal material. During the process of ageing, excessive water is evaporated and enzymatic reactions (such as hydrolysis of the glycone portion of glycosides) or oxidation may occur to alter the chemical composition of the herbal material. For example, in cascara (*Frangula purshiana* Cooper) bark, after proper ageing (at least one year, or having been artificially heated to speed up the process), the reduced forms of the emodin glycosides in the fresh bark are converted to monomeric oxidized emoting glycosides. The latter form of glycosides are milder cathartic agents, with reduced irritating effects that may cause vomiting and stomach upsets, and hence, are more suitable as a therapeutic agent.

Sweating
A similar process known as sweating (for example, fermentation) involves keeping the herbal materials at a temperature of 45–65 °C in conditions of high humidity for an

extended period, from one week to two months, depending on the plant species. The sweating process is considered a hydrolytic and oxidative process in which some of the chemical ingredients within the herbal materials are hydrolyzed and/or oxidized. The herbal materials are usually densely stacked between woolen blankets or other kinds of cloth. For example, vanilla beans (*Vanilla planifolia* Jacks. ex Andrews) are well known to undergo repeated sweating between woolen blankets in the sun during the day and packed in wool-covered boxes at night for about two months. During this process, the vanilla pods lose up to 80% of their weight and take on the characteristic colour and odour of vanilla.

Parboiling (blanching)
After washing, certain herbal materials may undergo a parboiling or blanching process in which they are put into boiling water for a brief period without being fully cooked. Such a heating procedure may serve several purposes, such as improving storage life of the processed materials by gelatinizing the starch, preventing mould or insect contamination, easily drying, destroying enzyme activity to prevent the alteration of certain chemical constituents, and facilitating further processing such as removal of the seed coat of almonds.

Boiling or steaming
The boiling process involves cooking the herbal materials in water or another liquid such as vinegar, wine, milk or other vehicle. In the steaming process, herbal materials are kept separate from the boiling water but have direct contact with the steam, resulting in a moist texture of the herbal materials. Often, the herbal materials are placed in a steamer or in a special utensil equipped with a flat frame suspended over boiling water. In some cases, the herbal materials are pre-mixed with excipients substances such as wine, brine or vinegar before being steamed. The boiling or steaming process serves to soften plant tissues, to denature enzymes present in the herbal materials, and/or to thermally degrade selected chemical constituents. At the same time, the excipients, if used, is absorbed into the plant tissues to become an integral part of the processed herbal materials. For example, *Reynoutria multiflora* (Thunb.) Moldenke (synonym *Polygonatum multiflorum* Thumb.) root is often steamed in the presence of a black bean (*Phase olus vulgaris* L.) decoction in order to enhance its tonic effects. Boiling the raw herbs such as Croton trillium, Bares precatorius, Nerium oleander and *Gloriosa superba* L., in cow's milk is practiced in some traditional medicine contexts to reduce the levels of their toxic ingredients and thus diminish the toxicity of the herbal materials.

Sun-drying
Some herbal materials can be dried in the open air under direct sunlight, provided the climate is suitable. The duration of the drying process depends largely on the physical state of the herbal material and the weather conditions. For natural drying in the open air, medicinal plant materials should be spread out in thin layers on drying frames and kept away from sources of possible contamination such as vehicle exhaust, heavy dust and rain. They should also be protected from insects, rodents, birds and other pests, livestock and domestic animals. The material should be turned periodically to achieve uniform drying. The drying frames should generally be set up at a sufficient height (for example, 15 cm) above the ground. Efforts should be made to achieve uniform drying within the shortest possible time to avoid mould formation.

Shade-drying
Herbal materials can be dried in the shade with or without artificial airflow to avoid direct exposure to strong sunlight. The drying process is slow, but it is preferred when it is necessary to maintain (or minimize loss of) colour of leaves and flowers. Low temperatures (relative to heat-drying) will also preserve most of the volatile and aromatic components by reducing evaporation.

Drying by artificial heat
Drying by artificial heat can be faster than open-air drying and is often necessary on rainy days or in regions where the humidity is high. Drying of herbal materials may be done using ovens, stoves, rack dryers, solar dryers, tunnel dryers, belt dryers, other heating devices or open fires. The use of an open fire should be avoided as much as possible, as residues of combustion may introduce contamination. When an open fire is used, the area must be well ventilated. For artificial heat-drying, the temperature, humidity and other conditions should be governed by the physical nature of the herbal material being dried and the physical/chemical properties of its active ingredients. Over-heating may lead to an excessive loss of the volatile components and/or decomposition of chemical constituents. In general, the temperature should be kept below 60 °C for bark and root and below 40 °C for leaves, herbs and flowers.

Advanced cutting, sectioning and comminution
When thoroughly dried, the herbal materials are processed by cutting and sectioning into convenient or specific sizes and shapes or forms for storage, direct use as decoction slices or pieces, and/or for further processing for the manufacture of herbal preparations or herbal dosage forms. Decoction slices or pieces are available in many Member States for direct use as herbal medicines. Where applicable, the entire, sectioned or cut herbal materials are comminuted or pulverized into powder form in accordance with common herbal medicines practice, for use as herbal dosage forms.

Preparation of herbal materials for processing
In general, for processes such as extraction, fractionation, purification and fermentation.

Extraction
Extraction is a process in which soluble plant chemical constituents (including those which have therapeutic activity) are separated from insoluble plant metabolites and cellular matrix, by the use of selective solvent (which is sometimes called the menstruum). The purpose of extraction of herbal material is to eliminate unwanted materials and to concentrate other chemical constituents in a soluble form. Herbal extracts include liquid (fluid) extracts, soft extracts, oleoresins, dry extracts and others. The herbal preparations so obtained may be ready for use as medicinal agents, or they may be further processed into herbal dosage forms such as tablets and capsules.
Various techniques are used for extraction, including maceration, infusion, digestion, percolation - including hot continuous (Soxhlet) extraction - and decoction.
Other extraction techniques can also be applied, for example, heat reflux extraction, counter-current extraction, microwave-

assisted extraction, ultrasonic extraction (sonication) and supercritical fluid extraction.

Common methods of extraction

1. Maceration

Maceration involves the procedures of mixing the properly comminuted herbal materials with the solvent and allowing the mixture to stand at a certain temperature for a defined period of time, agitating as necessary. During the maceration process, chemical constituents are extracted from the plant tissues through a dissolution process into the liquid solvent.

2. Infusion

Infusion refers to an extraction procedure in which boiling water is poured on the herb or herbal material to produce a dilute liquid preparation. Typically, the herb or herbal material is allowed to stand for some time (usually 5-20 minutes).

3. Percolation

Percolation is the procedure in which the solvent is allowed to continuously flow through the herbal material in a percolator (a vessel with an outflow at the bottom end). Typically, the properly comminuted herbal material is moistened with an appropriate amount of solvent and allowed to stand (macerate) for a few hours before being packed into the percolator. Additional solvent is added to totally wet the comminuted herbal material for some time. The bottom end (valve) of the percolator is then opened (adjusted), with fresh solvent being replenished from the top of the percolator to maintain a steady flow of solvent through the bed of herbal material. The flow rate of the liquid is controlled by adjusting the valve of the outlet. The extraction liquid is collected from the bottom outlet of the percolator. When the process is completed, the marc may be pressed and all liquids pooled to obtain the percolate. In addition to the solvent used for the extraction, the flow rate and the temperature influence the extraction yields and they have to be carefully controlled. Percolation is often used for an exhaustive extraction of the herbs and is applicable to both initial and large-scale extraction.

4. Decoction

Decoction is the most common method for making herbal preparations in various traditional medicine contexts. It involves boiling the herbal material in water, during which time the chemical constituents are dissolved or extracted into the hot liquid. This procedure is suitable for extracting soluble and heat stable active constituents of the herb or herbal material.

5. Supercritical fluid extraction

Supercritical fluid extraction is a modern technique making use of the solvating property of a fluid in its supercritical state (carbon dioxide is the most common supercritical solvent) to dissolve the chemical constituents in herbal materials. The density of the supercritical fluid (thus its solvating property) can be adjusted by altering the temperature and pressure, or by the addition of modifiers (for example, ethanol) to change the polarity of the supercritical fluid.

Syrup

The syrup is a saturated or concentrated, viscous aqueous solution of sucrose/sugar substitute with or without flavor/medicinal substances in purified water.

Simple syrup contain 85% w/v (65% w/w); specific gravity 1.313 (USP) or 66.7% w/w as per Indian Pharmacopeia/BP. [11].

Types of syrup

Simple syrup	Medicated syrup	Herbal syrup
Syrup is viscous, concentrated or nearly saturated aqueous solution of sucrose containing 66.7% w/w of sugar.	Medicated syrups are nearly saturated solution of sugar in water in which medicaments and drugs are dissolved. It is intended for oral use.	Herbal syrup Is prepared by mixing a concentrated decoction with either honey or sugar or alcohol. It is intended for oral use. Herbal syrups shows a more potent action then other types of syrup.

Advantages

- Good patient compliance.
- They are more palatable.
- Disguised the bad taste of medication.

Disadvantages

- During storage it causes a crystallization of the sugar within the screw cap.
- Not suitable in emergency and unconscious patients.
- Delayed onset of action because absorption takes time [12].

Ingredients used in polyherbal syrup

Following ingredients are used in Polyherbal anti-diabetic syrup are listed below.

***Moringa oleifera* leaf**

Moringa oleifera Lamarck (*Moringa*) is the cultivated species of the genus *Moringa* of the family *Moringa*ceae [13]. Is a perennial tropical deciduous tree with high economic and pharmaceutical value? As an edible plant, *M. oleifera* Lam. Is rich in nutrients, such as proteins, amino acids, mineral elements and vitamins. Besides, it also contains an important number of bioactive phytochemicals, such as polysaccharides, flavonoids, alkaloids, glucosinolates and isothiocyanates. *M. oleifera* for long has been used as a natural anti-diabetic herb in India and other Asian countries. Thus, the anti-diabetic properties of *Moringa* plant have evolved highly attention to the researchers. In the last twenty years, a huge number of new chemical structures and their pharmacological activities have been reported in particularly the anti-diabetic properties [14, 15].

Chemical profile of active ingredients

***Psidium guajava* leaves**

Psidium guajava Linn. (Myrtaceae) commonly known as Peru or Guava in English. The *Psidium guajava* leaves are used in the treatment of diarrhoea, cough, stomach-aches, dysentery and decoction of the leaves for cholera patients, toothache and gum boils. The leaves showed hypoglycemic, cardioprotective, myocardial depressant, antimicrobial, antispasmodic actions (Ross, 1999). Inhibition of alpha-amylase and alpha-glucosidase enzymes can be an important strategy in management of post pyramidal blood glucose level in type 2 Diabetes patient (Ali *et al*., 2006) [16]. Guava leaves have been used as a folk medicine or herbal tea to treat diarrhea and diabetes in India, China, Pakistan, Bangladesh, and Mexico for a long time due to lower toxicity and good therapeutic function. Diaz-De-Cerio *et al*. verified that the hypoglycemic effects of guava-leaf methanolic extract were associated with improving endothelialdys function analysis.

The guava (*Psidium guajava* L.) tree belonging to the Myrtaceae family, is a very unique and traditional plant which is grown due to its diverse medicinal and nutritive properties. Guava has been grown and utilized as an important fruit in tropical areas like India, Indonesia, Pakistan, Bangladesh, and South America. Different parts of the guava tree, i.e., roots, leaves, bark, stem, and fruits, have been employed for treating stomachache, diabetes, diarrhea, and other health ailments in many countries. Guava leaves (*Psidii guajavae* folium; GL) are dark green, elliptical, oval, and characterized by their obtuse-type apex. Guava leaves, along with the pulp and seeds, are used to treat certain respiratory and gastrointestinal disorders, and to increase platelets in patients suffering from dengue fever.

***Clitoria ternatea* flower**

Clitoria ternatea belonging to the family Fabaceae, commonly known as Butterfly pea. It is a perennial twinning herb with blue and white flowers (Aruna *et al*., 1999) *Clitoria ternatea* has long been used in traditional medicine, primarily as supplementation to improve cognitive function and relieve symptoms of a wide range of illnesses such as fever, inflammation, pain, and diabetes [18]. Its extracts possess a wide range of pharmacological activities including anti-microbial, anti-pyretic, anti-inflammatory, analgesic, diuretic, local anesthetics, anti-diabetic, insecticidal, blood platelet aggregation inhibiting and for use as a vascular smooth muscle relaxing properties (Mukherjee *et al*., 2008; An and *et al*., 2011). Based on this aspect, we were selected the plants *Clitoria ternatea* Linn for treatment of diabetes mellitus [19].

***Emblica officinalis* gaertn**

Embolic officinal is Gaertn. (syn: *Phyllanthus umbilical*.) (Euphorbiaceae) grows in tropical and subtropical parts of China, India, and the Malay Peninsula. The fruit is commonly known as amla or emblic myronalan, and is of high value in traditional Indian medicine. Several constituents of E. officinal are have been identified: the hydrolysable tannins and its derivatives are the key Ingredient of Quercetin is one of the flavonoids found in the fruits of medicinal plant [20]. *Phyllanthus emblica* is a fruit widely consumed in subtropical areas, which is rich in polyphenols and other nutrients. There are increasing evidences that as a daily and nutritious fruit, it may have a positive role in controlling diabetic complications [21].

Plant profile of polyherbal anti-diabetic syrup

Sr. No	Plant	Biological Name	Family	Chemical constituents	Uses
1.	*Moringa oleifera* Leaf	*Moringa oleifera* Lom	*Moringa*cea	Flavonoids, saponins, tannins, catechol tannins, anthraquinones, alkaloids	Antioxidants, anti-diabetic, antimicrobial and anti-carcinogenic agents
2.	*Psidium guajava* Leaves	*Psidium guajava*	Myrtaceae	Glycosides, flavonoids, saponins, polyphenols, terpenoids and tannins	Gastrointestinal diseases, Lower blood sugar level, wounds, caries, and cough
3.	*Clitoria ternatea* Leaves	Butterfly	Fabaceae	Saponins, tannins, flavonoids, terpenoids, glycosides, amino acid, antraquanine, phenols, alkaloids, proteins and steroids.	Anti-inflammatory, analgesic, and diabetes, antipyretic anti-microbial, anti-pyretic, anti-inflammatory, analgesic, diuretic, local anesthetics, anti-diabetic, insecticidal, blood platelet aggregation inhibiting etc.
4.	Emblica-Officinalis (Amla)	*Phyllanthus emblica* L., Alma/Indian gooseberry	Euphorbiaceous	Ellagic acid, chebulinic acid, Gallic acid, chebulagic acid, apeigenin, quercetin, corilagin, leutolin, etc.	Antibacterial, antifungal, antiviral, anti-diabetic, hypolipidemic, anti-ulcerogenic, free radical scavenging, antioxidant, anti-mutagenic, anti-inflammatory, immunomodulatory, antipyretic, analgesic, antitussive, anti-atherogenic, adaptogenic etc.

Excipient profile

Table 1: Excipent profile for Polyherbal anti-diabetic syrup

Sr. No	Excipients	Uses
1.	Propylene Glycol	Food additive, Drug stabilizer
2.	Methyl Paraben	Preservative
3.	Peppermint oil	Flavoring Agent
4.	Amaranth Solution	Colouring Agent
5.	Honey	Sweetening Agent, Thickening Agent
6.	Purified Water	Vehicle

Methodology

Collection and Extraction of Plant Material
↓
Collection of Maringa leaves
↓
Cleaning with distilled water
↓
Cabinet drying or shade drying (for 6 days)
↓
Grinding
↓
Collection of powder
↓
Powder dissolve in 94% methanol In air tight container
↓
Allow to 3 days and filtrate
↓
Residue are again allow in methanol for 2 days
↓
Again filtrate and obtain extraction
↓
Collection of *Psidiumguajava* leaves
↓
Washing (distilled water)
↓
Drying of leaves (cabinet drier)
↓
Grinding
↓
Collection of powder
↓
Powder add into 94% methanol in air tight container
↓
Allow to 5 days
↓
Filter and collect the extraction
↓

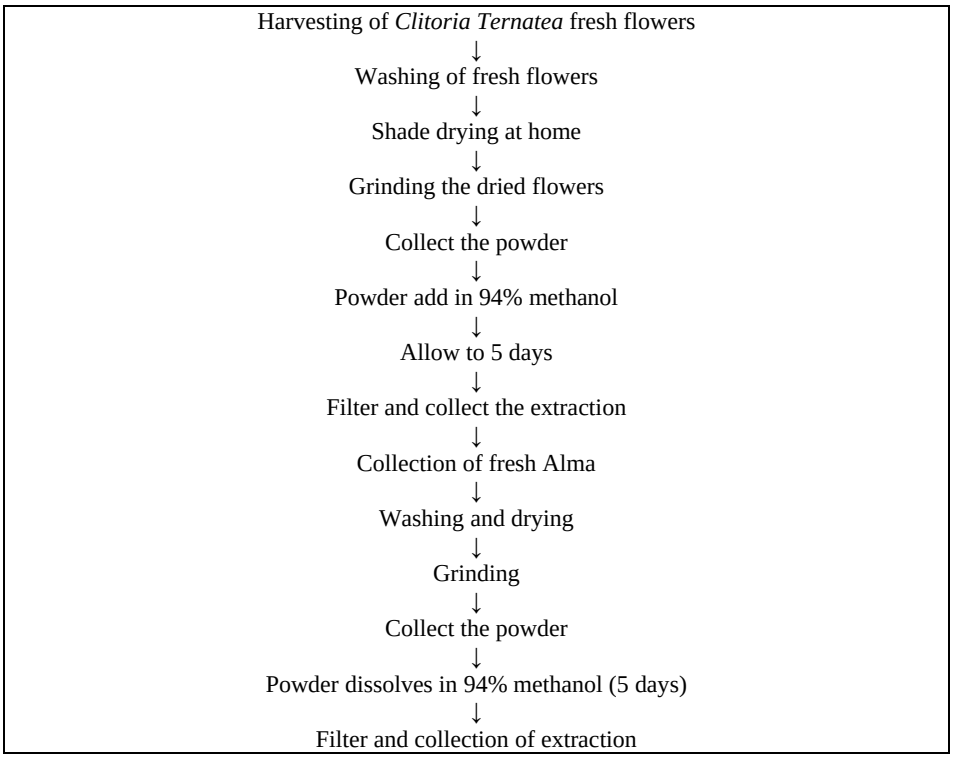

Fig 1: Flow chart of *Moringa oleifera* extraction

Formulation of poly-herbal syrup [100 ml]

Sr. No.	Ingredient	Quantity taken
1.	*Moringa oleifera* Leaves Powder	5 gm
2.	*Clitoria ternatea* flower powder	5 gm
3.	*Phyllanthus emblica* fruit powder	5 gm
4.	*Pisidium guajava* leaves powder.	5 gm
5.	Methyl Paraben	5 gm
6.	Propylene Glycol	5 ml
7.	Peppermint oil	3 ml
8.	Amaranth Solution	0.3 ml
9.	Honey	66.7gm
10.	Purified Water	Upton 100 ml

Anti-Diabetic herbal syrup is prepared by using the following three steps

Step 1: Method of preparation of decoction

- 5 gm of *Moringa* leaves powder + 5 gm of *Clitoria ternatea* flower powder + 5gm of *Phyllanthus emblica* fruit powder + 5 gm of *Pisidium guajava* leaves powder.
- Mixed in 1000 ml of purified water.
- Boil until total volume becomes 1/4th of initial volume.
- Then cool the decoction.
- After cooling filter with filter press.

Step 2: Method of preparation of simple syrup

- Mix 66.7%w/w of honey in required quantity of distilled water to prepare a concentrated solution of simple syrup.

Step 3: Method of preparation of herbal syrup

- Filtrate was taken and added to simple syrup yield final syrup
- For the preparation of final herbal syrup, mix one part of decoction with five parts of simple syrup [1:5].
- Then add excipient and finally make up the value to 100 ml with purified water.

Aramevaluation peter

1. Colour: Colour examination is done by observing the syrup directly with our naked eye

2. Odour: 5 ml of final syrup was smelled individually then the odor can be detected

3. Taste: A pinch of final syrup was taken on taste bud of tongue to detect the taste.

4. Determination of pH

Take 10 ml of final syrup in the volumetric flask and make up the volume up to 100 ml with distilled water. The pH was measured by using digital pH meter.

5. Determination of viscosity

Viscosity of syrup can be determined by using Ostwald viscometer. First clean the Ostwald viscometer thoroughly with warm chromic acid or acetone Place the viscometer in vertical position on a suitable stand now fill the water up to mark "G" in dry viscometer. Note the time required for water to flow from mark A to mark B. For at least three times, repeat the filling process and note the time to obtain accurate readings. Now rinse the viscometer and fill it with test liquid (syrup) till mark a, find out the time required for liquid to flow to mark B. The density can be determined by using specific gravity bottle.

Formula for viscosity = Density of test liquid × Time required to flow test liquid × Viscosity of water

Viscosity = Density of water × Time required to flow water.

6. Determination of density

The density of syrup can be determined by using specific gravity of bottle. Clean the specific gravity bottle thoroughly with chromic acid or nitric acid. With the distilled water rinse the bottle for two to three times. Note the weight of empty dry bottle with capillary tube stopper (w1). Now fill the bottle with UN know liquid and place the stopper and wipe of the excess liquid outside the bottle with unknown liquid in analytical balance (w2). Finally calculate weight in grams of UN known liquid

Formula for density

$$\text{Density of liquid under test (syrup)} = \frac{\text{Weight of liquid under test}}{\text{Volume of liquid under test}}$$

7. Determination of specific gravity

Rinse the bottle for two to three times with purified water after cleaning it with chromic acid or nitric acid. If requires rinse the bottle with acetone and dry it. Take the weight of empty dry bottle with capillary tube stopper (w1). Fill the bottle distilled water and place stopper; wipe off excess liquid from outside of tube. And weigh the bottle with distilled water on analytical balance (w2). Repeat the same procedure by replacing water with liquid under test (syrup) after emptying and drying. Weigh the bottle with stopper and liquid under test on analytical balance (w3).

Formula for specific gravity

$$\text{Specific gravity of liquid Under test (syrup)} = \frac{\text{Weight of liquid under test}}{\text{Weight of water}}$$

Evaluation test

Sr. No.	Evaluation parameters	Test
1.	Colour	Slightly brown
2.	Oder	Pleasant
3.	Test	Sweet
4.	pH	6
5.	Viscosity	0.25 poise
6.	Density	14.5 gm
7.	Specific	-

Conclusion

Herbal medicines are still widely using for primary health care in so many countries because of cultural acceptability, compatibility with human beings and with lesser side effects. In this study we prepare Anti diabetic herbal syrup by using leaf extract of *Moringa oleifera*, *Psidium guajava*, flower extract of *Clitoria ternatea* and Fruit of *Phyllanthus emblica*. *Moringa* lowers cholesterol levels by increasing good cholesterol in the body. It is also good for diabetics as it helps lower blood sugar levels. Sheen *et al*. verified that aqueous soluble extract from guava leaves has Ant hyperglycemic function against type 2 diabetes. The flower extracts of *Clitoria ternatea* tested for anti-diabetic activity as it significantly lowered the serum glucose levels. *Clitoria ternatea* scientifically justifies the use in the folklore remedies for anti-diabetic activity. *Phyllanthus emblica* comprises chromium, a mineral that regulates carbohydrate metabolism and is said to make the body more responsive to insulin, further keeping the blood sugar levels in check. The prepared herbal syrup subjected to various evaluation parameters and compared with standard Anti diabetic syrup. The above Review indicates that the leaf and flower extracts have a hypoglycemic effect.

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