



FORMULATION AND EVALUATION OF POLYHERBAL ANTIDIABETIC SYRUP

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Abstract: Hyperglycemia and decreased insulin function characterise diabetes mellitus, a chronic metabolic illness. Traditional medical practises, particularly herbal therapies, have been investigated in the hunt for diabetic treatments that are both safe and effective. The goal of this study was to create and assess a polyherbal anti-diabetic syrup made of a variety of medicinal plants thought to have anti-diabetic characteristics. Based on available research and conventional wisdom, effective anti-diabetic herbs were chosen for the formulation procedure. *Gymnema sylvestre*, *Momordica charantia*, *Azadirachta indica*, and *Trigonella foenum-graecum* were among the chosen herbs. The potential of these herbs to improve insulin sensitivity, increase insulin production, and reduce glucose absorption led to their selection. To ensure maximum bioactive compound extraction while keeping the overall stability and safety of the syrup, the extraction and preparation of the herbal constituents were optimised. A number of quality control experiments were performed on the developed polyherbal syrup to evaluate its microbiological, chemical, and physical characteristics

I. INTRODUCTION

The majority of ailments can now be treated using herbal medication. Together with a healthy diet and lifestyle, they work to achieve specific health objectives by giving every cell the best possible nutrition. These organic Supplements, unlike synthetics, do not have any negative side effects that could affect physical health. When every There is an alternate natural medication to the synthetic drug present. The ongoing quest of man for a terrible illness's treatment has led him to finally make it to our traditional medicine. Herbal, Ayurvedic, Siddha, Unani, Islamic, Traditional Chinese, Traditional Vietnamese, acupuncture, Muti, Ifa, Traditional African, and other medical practises are examples of indigenous medicines. Indigenous medicines are used all over the world.

Diabetes mellitus

Diabetes mellitus is a series of chronic metabolic disorders brought on by persistently elevated blood sugar levels. Diabetes is brought on by either insufficient insulin production by the pancreas or improper insulin utilisation by body cells. According to the WHO, Diabetes Mellitus is a heterogeneous metabolic illness distinguished by a chronic hyperglycemia-related disruption of the metabolism of carbohydrates, proteins, and fats as a common feature.

Types of diabetes

Type - I diabetes (insulin dependent diabetes mellitus)

Type - II diabetes (formerly, non-insulin dependent diabetes mellitus) Gestational diabetes (first recognition during pregnancy)

Diabetes due to other causes (genetic defects or medication)

*Syrup***Simple Syrup**

Syrup is viscous, concentrated or nearly saturated aqueous solution of sucrose containing 66.7 % w/w of sugar.

Medicated syrup

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

An herbal syrup is prepared by mixing an concentrated decoction with either honey or sugar or alcohol. It is intended for oral use. Herbal syrups shows an more potent action then other types of syrup. Fenugreek

Fenugreek seed (*Trigonella foenum-graecum*) has been studied for its potential benefits in managing diabetes. It contains several bioactive compounds, including fiber, saponins, flavonoids, and alkaloids, which are believed to contribute to its therapeutic effects. In recent years, fenugreek has garnered scientific interest, and several studies have explored its potential health benefits.

Blood Glucose Control : Fenugreek seed has been shown to help lower blood glucose levels

Glycemic Control: Research suggests that fenugreek seed may help improve glycemic control in individuals with diabetes

Insulin Secretion and Action: Fenugreek seed may have a positive impact on insulin secretion and action.

Lipid Profile Improvement: Diabetes is often associated with dyslipidemia, characterized by abnormal lipid levels.

Anti-inflammatory and Antioxidant Effects: Chronic inflammation and oxidative stress play a role in the development and progression of diabetes and its complications.

Classification

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Fabaceae
Genus	<i>Trigonella</i>
Species	<i>foenum-graecum</i>
Binomial name	<i>Trigonella foenum-graecum</i>



Other Common Names -Greek hay, Bird's Foot, Boyotu Chinagriye, Fenegriek, Fenugreek, Foenum Graecum, Greek Hay-seed, Halva, Helba, Hu Lu Pa, KU Tou, Kelabat, Korotus. Methi Shim, Sickle-fruit Fenugreek and Sicklefruit Fenugreek .



Jamun

Jamun seed, also known as Indian blackberry seed or *Syzygium cumini* seed, has been traditionally used in Ayurvedic medicine for its potential therapeutic effects, including its role in managing diabetes. Jamun seed is rich in various bioactive compounds, such as polyphenols, flavonoids, and tannins, which may contribute to its potential benefits.

Blood Glucose Regulation: Jamun seed has been studied for its hypoglycemic effects, meaning it may help lower blood glucose levels. It contains compounds that may enhance insulin action, promote glucose uptake by cells, and inhibit glucose absorption from the intestines. This can contribute to better blood sugar control.

Insulin Secretion: Jamun seed may have the ability to stimulate insulin secretion from the pancreatic beta cells. This can help improve and release, thereby aiding in the regulation of blood sugar levels. **Antioxidant Properties:** Diabetes is associated with increased oxidative stress, which can lead to cellular damage. Jamun seed contains antioxidants that help neutralize harmful free radicals, reducing oxidative stress and protecting cells from damage.

Lipid Profile Improvement: Individuals with diabetes often have abnormal lipid profiles, including elevated levels of total cholesterol, LDL cholesterol, and triglycerides. Jamun seed has been reported to have lipid-lowering effects, promoting a healthier lipid profile.

Renal Protection: Diabetes can lead to kidney damage, known as diabetic nephropathy. Studies suggest that jamun seed may help protect the kidneys from oxidative stress and reduce markers of kidney damage, potentially contributing to renal protection.

Classification

Kingdom	Plantae
Clade	Trichophyte's
Clade	Angiosperms
Clade	Eudicots
Clade	Rosids
Order	Myrtales
Family	Myrtaceae
Genus	<i>Syzygium</i>
Species	<i>S. cumini</i>

Binomial name *Syzygium cumini*

Paneer phool

Withania coagulans, also known as Indian rennet or Paneer dodi, is a plant that is native to India and Pakistan. While it is not as widely studied as other herbs such as fenugreek or jamun, *Withania coagulans* has been used in traditional medicine for various purposes, including its potential effects on diabetes.

Blood Glucose Control: *Withania coagulans* has been reported to possess hypoglycemic effects, which means it may help lower blood glucose levels.

Antioxidant Activity: *Withania coagulans* contains bioactive compounds with antioxidant properties. Antioxidants help reduce oxidative stress, which is associated with diabetes complications.

Anti-inflammatory Effects: Chronic inflammation is linked to the development and progression of diabetes.

Lipid Profile Improvement: *Withania coagulans* has been studied for its potential lipid-lowering effects. Dyslipidemia, characterized by abnormal lipid levels, is commonly observed in individuals with diabetes.

Classification

Kingdom	Plantae		
Clade	Tracheophytes		
Clade	Angiosperms		
Clade	Eudicots		
Clade	Asterids		
Order	Solanales		
Family	Solanaceae		
Genus	<i>Withania</i>		
Species	<i>W. coagulans</i>		
Binomial name	<i>Withania coagulans</i> (Stocks) Dunal		
Synonyms	<i>Puneeria coagulans</i> Stocks		

METHODOLOGY

Preliminary phytochemical screening of the herbs

Sr. No.	Plant constituent's	Test/Reagent
1.	Sterols	Salkowaski Liebermann's Liebermann-Burchard
2.	Alkaloids	Dragendorff's Hager's Mayer's Wagner's
3.	Saponins	Foam test
4.	Glycoside	Keller-killiani test Legal test Kedde's test Borntrager's test Modified Borntrager's Test

5.	Tannins	Ferric Chloride Lead acetate Pot. Dichromate
6.	Flavonoids	Shinoda test
7.	Carbohydrates	Molisch Fehlings Barfoed's
8.	Amino acid	Ninhydrine
9.	Protein	Millon's Biuret Xanthoproteic

FORMULATION OF HERBAL SYRUP

Preparation of antidiabetic herbal syrup

Sr.no	INGREDIENT	USES
1	Fenugreek seed Powder	Reduce the risk of diabetes Improvement milk production and flow Improve weight loss Reduce inflammation
2	Jamun seed Powder	Used to treat type 2 diabetes mellitus, worm infection, asthma, diarrhea, cough and cold. It is an anthelmintic, and also used to treat ulcers, dysentery, bronchitis. It purifies blood
3	Panner phool Extract	Anti-bacterial Anti-fungal Show diuretic property
4	Peppermint oil	Flavouring agent Topical analgesic
5	Erythrosine	Coloring agent Biological stain Printing ink
6	Sugar	Excipient
7	Purified water	Excipient
8	Methyl paraben	Preservative Antifungal preservative Prevents germ growth

Simple syrup

MODELING AND ANALYSIS

To prepare a simple syrup using stevia as a natural sweetener, follow these steps:

1 cup water

Stevia powder or liquid extract (to taste)

- In a small saucepan, combine 1 cup of water with the desired amount of stevia. The amount of stevia will depend on your taste preference and the brand's instructions. Start with a small amount and gradually increase if needed.
- Place the saucepan over medium heat and stir the mixture until the stevia is completely dissolved.
- Bring the mixture to a gentle simmer, stirring occasionally. Let it simmer for about 5 minutes to allow the flavors to meld. Remove the saucepan from the heat and let the simple syrup cool to room temperature.
- Once cooled, transfer the simple syrup to a clean glass jar or bottle. You can strain it through a fine-mesh sieve or cheesecloth if desired, to remove any undissolved stevia particles.
- Seal the jar or bottle tightly and store it in the refrigerator. The simple syrup made with stevia should keep well for about 1 to 2 weeks.

Preparation of flavor solution

To prepare a flavor solution using peppermint oil, follow these steps:

Ingredients:

Peppermint oil (food-grade)

Carrier oil (such as vegetable oil or almond oil) Glass dropper bottle

Instructions:

- Start by selecting a high-quality, food-grade peppermint oil. Make sure it is specifically labeled for culinary use.
- Choose a carrier oil to dilute the peppermint oil. Carrier oils help disperse the flavor and ensure it's safe for consumption. Vegetable oil or almond oil are commonly used as carrier oils.
- Determine the desired strength of the flavor solution. The amount of peppermint oil used will depend on personal preference and the intended use of the solution. A general guideline is to use 1-2 drops of peppermint oil per ounce (30 mL) of carrier oil for a mild to moderate flavor. You can adjust the ratio to make it stronger or weaker as desired.
- Prepare a clean glass dropper bottle for storing the flavor solution. Glass bottles are preferred over plastic ones to avoid any potential interaction between the oil and the container.

Addition of excipients:

Excipients are inactive ingredients added to pharmaceutical formulations, including syrups, to aid in the manufacturing process, improve stability, enhance palatability, or facilitate drug delivery.

- **Preservatives:** Syrups may contain preservatives to inhibit the growth of microorganisms and extend the shelflife of the product. Common preservatives used in syrups include benzoic acid, sorbic acid, and parabens.
- **Stabilizers and Thickeners:** Stabilizers and thickeners are added to syrups to improve their consistency, prevent separation, and provide a uniform distribution of the active ingredients.
- **Coloring Agents:** Coloring agents may be added to syrups to enhance their visual appeal and aid in product identification.

Preparation of polyherbal syrup

Extraction of herbs place in the pot and put on the stoves or medium heat and bring them mixture to a gentle boil. Once it starts boiling, reduce the heat to low and let the mixture simmer for about 20 to 30 minutes. This simmering process allows the herbs to release their beneficial compounds into the liquid.

After simmering, remove the pot from the heat and let it cool slightly. Strain the liquid through a fine-mesh sieve or cheesecloth into a clean container, separating the herbal residue from the liquid. If desired, add a natural sweetener like honey or stevia to the strained liquid. This step is optional and can help improve the taste of the syrup.

Stir the sweetener into the liquid until it is fully dissolved. Taste the syrup and adjust the sweetness according to your preference. Once the syrup has cooled to room temperature, transfer it to a glass jar or bottle with a tight-fitting lid. Make sure to label it with the contents and the date of preparation.

Formulation formula for polyherbal syrups

Sr. No.	Ingredients	Quantity for 100ml			
		F1	F2	F3	F4
1.	Paneer Phool	20gm	22gm	18gm	20gm
2.	Jamun Seeds	15gm	17gm	14gm	14.5gm
3.	Fenugreek Seeds	15gm	15gm	13.5gm	14gm
4.	Pippermint oil	5ml	4.5ml	4ml	5ml
5.	Erythrosine	3ml	2.5ml	2ml	3ml
6.	Methylparaben	5ml	5.5ml	4.5ml	4ml
7.	Stevia	3ml	2.5ml	2ml	3.5ml
8.	Purified water	Upto 100ml	Upto 100ml	Upto 100ml	Upto 100ml

Evaluation Parameters Table

Colour	Pinkish Red
Odour	Aromatic
Taste	Sweet, Mellowed and Masked
pH	3.0 to 7.0
Viscosity	2000 to 3000 cts
Density	1.48 gm/cm ⁻³

II. RESULTS AND DISCUSSION

However, research studies on polyherbal antidiabetic formulations have explored various aspects, including their effects on blood glucose control, insulin sensitivity, lipid profiles, and antioxidant status in individuals with diabetes. Some

studies have shown promising results indicating the potential benefits of polyherbal antidiabetic syrups, while others may have found inconclusive or varied outcomes. It's important to note that the efficacy and safety of polyherbal antidiabetic syrups can vary depending on the specific formulation, dosage, and individual response. Additionally, regulatory bodies often require rigorous testing and clinical trials before a product can make specific health claims.

To obtain the most accurate and up-to-date information on the results of a specific project or study on polyherbal antidiabetic syrups, it would be best to refer to scientific journals, research papers, or consult with healthcare professionals or researchers who have access to the latest research in the field.

III. CONCLUSION

Herbal medicines are used by 50% of world population, because of their better acceptability, better compatibility with humans. It has lesser side effects than synthetic ones. In this study we prepared an Polyherbal anti-diabetic syrup using a leaf extract of Paneer phool, Fenugreek seed extract of Indian Black jamun, these three herbals possess a potent anti-diabetic effect as referred from the literature study. The prepared syrup undergoes various evaluation parameters and it possesses the value within the standard limits.

Herbs are used to manage Type 1 and Type II diabetes and their complications. For this, therapies developed along the principles of western medicine (allopathic) are often limited in efficacy, carry the risk of adverse effects, and are often too costly, especially for the developing world. Also the Physicochemical properties of prepared herbal syrup like colour, odour, taste, pH, viscosity and specific gravity were within standard limits, it has proper concentration of honey and also a good preservative. The results of stability study of the final syrup reveal that no changes were noticed in all the tested physicochemical parameters as well as

turbidity/homogeneity during 24 hours, 48 hours and 72 hours. Thus it can be concluded that the prepared poly herbal syrup may be used as a stable liquid dosage form.

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