

Polyherbal Formulation of Syrup for Metabolic Disorder

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Abstract: Diabetes mellitus is an chronic metabolic disorder characterized with the aid of hyperglycemia and altered metabolism of carbohydrates, lipids and proteins. it is a situation that impairs the body's capability to process blood glucose as end result of this accelerated blood glucose stage happens in our body, which reasons an diabetes mellitus. the present have a look at well-known shows to increase an Polyherbal anti-diabetic natural syrup by way of the use of an extract of an leaves of *Annona squamosa* and dried seeds of *Syzygiumcumini* and *Trigonella foenum-graecum*. 3 method of herbal syrup had been formulated (F1, F2, F3) Herbs plants used in the formulations indicates an potent anti-diabetic motion over synthetic ones. F1, F2, F3 system had been organized and evaluated. *foenum-graecum*.

Keywords: Diabetic mellitus, polyherbal, syrup, antidiabetic, *Annona Squamosa*, *Trigonella Foneum Graceum*, *Syzygiumcumini*

I. INTRODUCTION

Diabetes mellitus is a group of chronic metabolic disorder caused due to excessive blood sugar level over an extended duration. Diabetes as a result of both the pancreas now not generating sufficient insulin or the cells of the body not responding properly to the insulin produced.

The no of people with diabetes is growing due to population increase, growing older, urbanization and growing prevalence of obesity and bodily state of being inactive, quantifying the superiority of diabetes and the range of people tormented by diabetes, now and future, is important to allow rational making plans and allocation of resources. Diabetes education is a crucial element of the medical control of diabetes mellitus and DSME must continually be taken into consideration as a part of the treatment plan despite the fact that a affected person is suggested to have first rate metabolic manipulate. In current management of diabetes mellitus is crying want. due to the fact the diabetic sufferers are very lots unaware approximately the control of diabetes mellitus.

In the last few years there has been an exponential growth in the field of herbal medicine and these drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects. Many traditional medicines in use are derived from medicinal plants, minerals and organic matter. A number of medicinal plants, traditionally used for over 1000 years named rasayana are present in herbal preparations of Indian traditional health care systems. In Indian systems of medicine most practitioners formulate and dispense their own recipes. The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world. Among these 2500 species are in India, out of which 150 species are used commercially on a fairly large scale. India is the largest producer of medicinal herbs and is called as botanical garden of the world. The current review focuses on herbal drug preparations and plants used in the treatment of diabetes mellitus, a major crippling disease in the world leading to huge economic losses.

Diabetes mellitus (DM) is a chronic metabolic disease which is described by hyperglycemia and high blood sugar levels in postprandial and fasting state. It is characterized by defects in insulin secretion, insulin action, or both of them. Total number of diabetic patients in the world has been anticipated to rise from 171 million in 2000 to 366 million in 2030. Considering the long-term side effects of DM, it has become one of the major causes of morbidity in the world. There are different types of diabetes based on its pathogenesis, including insulin-dependent (type I), noninsulin-dependent (type II), and gestational. Type 2 DM is more common than the other types in which the body's insulin receptors become resistant to the normal insulin effects. Then β cells of the pancreas respond to the high blood glucose levels by producing more insulin to manage the situation. However, the insulin overproduction makes β cells wear themselves out. Patients with

DM may experience some complications such as retinopathy, neuropathy, nephropathy, cataracts, peripheral vascular insufficiencies, and damaged nerves resulting from chronic hyperglycemia. High blood glucose levels in type 2 DM can be controlled by using Hindawi Evidence-Based Complementary and Alternative Medicine. Different pathways and mechanisms are considered for preventing the progression of the disease, they may include inhibition of intestinal α -glucosidase and α -amylase, inhibition of aldose reductase, insulin synthesis and secretion, inhibition of lens aldose reductase, oxidative stress protection, inhibition of formation of advanced glycation end products, lowering plasma glucose levels, Blood glucose level : Fasting blood glucose level : 90 – 130 mg/dl Blood glucose level after 2 hours of meal greater than or equal to 150 mg/dl .

The increased blood sugar levels are termed as “hyperglycemia”

The decreased blood sugar levels are termed as “hypoglycemia”.

II. SIGNS AND SYMPTOMS

Weight loss

Polyuria (Increased urination)

Polydipsia (Increased thirst)

Polyphagia (Increased hunger)

Loss of vision

Slow healing of wounds

Itchy skin

Fatigue

The Diabetes mellitus mainly occurs due to

- i) Insulin deficiency [insulin dependent diabetes mellitus]
- ii) Insulin resistance [non insulin dependent diabetes mellitus]

III. DIBETIC MELLITUS

Diabetes mellitus is taken from the Greek word *diabetes*, meaning siphon - to pass through and the Latin word *mellitus* meaning sweet. Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Metabolic abnormalities in carbohydrates, lipids, and proteins result from the importance of insulin as an anabolic hormone. Low levels of insulin to achieve adequate response and/or insulin resistance of target tissues, mainly skeletal muscles, adipose tissue, and to a lesser extent, liver, at the level of insulin receptors, signal transduction system, and/or effector enzymes or genes are responsible for these metabolic abnormalities. The severity of symptoms is due to the type and duration of diabetes. Some of the diabetes patients are asymptomatic especially those with type 2 diabetes during the early years of the disease, others with marked hyperglycemia and especially in children with absolute insulin deficiency may suffer from polyuria, polydipsia, polyphagia, weight loss, and blurred vision. Uncontrolled diabetes may lead to stupor, coma and if not treated death, due to ketoacidosis or rare from nonketotic hyperosmolar syndrome.

IV. CLASSIFICATION OF DIBETIC MELLITUS

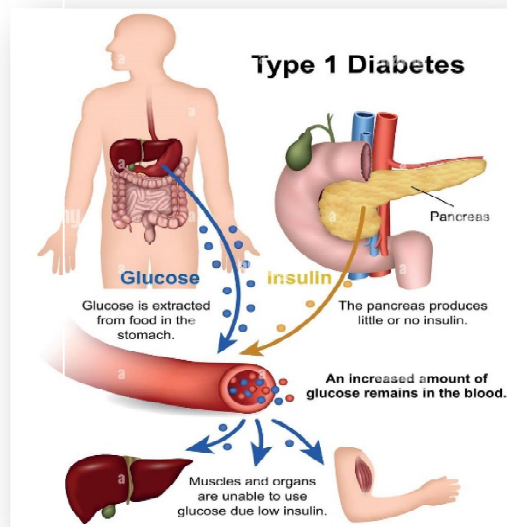
Type 1- Insulin Dependent Diabetes mellitus

Type 2 - Non- Insulin Dependent Diabetes mellitus

Type 3 – Gestational Diabetes mellitus.

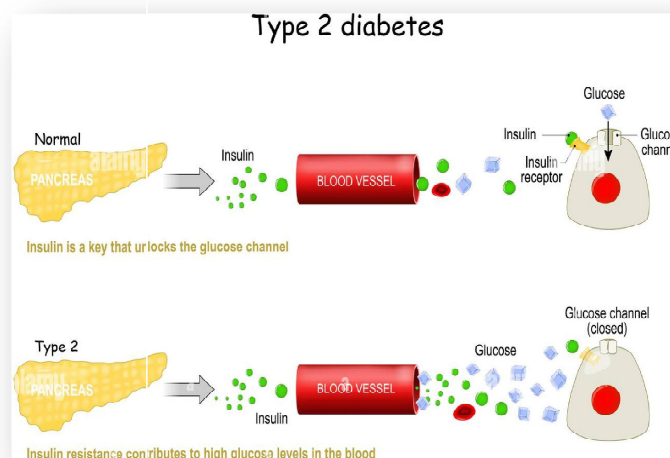
Type 1 – Insulin dependent diabetes mellitus

Insulin Dependent Diabetes mellitus [IDDM] is an autoimmune disorder, In which antibodies destroy the beta cells of the islets of langerhans in pancreas causes an insulin deficiency. In other words, pancreas fails to produce an enough insulin. Type 1 diabetes (also known as diabetes mellitus) is an autoimmune disease in which immune cells attack and destroy the insulin-producing cells of the pancreas. The loss of insulin leads to the inability to regulate blood sugar levels. Patients are usually treated by insulin-replacement therapy.



TYPE 2 – NON INSULIN DIBETIC MELLITUS

A chronic condition that affects the way the body processes blood sugar (glucose). With type 2 diabetes, the body either doesn't produce enough insulin, or it resists insulin. There is an reduced sensitivity of tissues to insulin and impairs an insulin secretion.



Type 3 : Gestational Diabetes mellitus, which occurs around 20-24 weeks of pregnancy during which placental hormones are raising and responsible for insulin resistance.

Pathophysiology

Insulin is an principal hormone that regulates the uptake of glucose from blood in to cells of the body, it plays an important role in balancing glucose levels in the body.

Insulin is released into the blood by beta cells of islets of langerhans present in the pancreas.

Decresed insulin release from the beta cells results in breakdown of glycogen to glucose. Due to insulin insufficiency glucose will not absorbed properly by body cells, which results in poor protein synthesis, high blood glucose level. Increased osmotic pressure of the urine causes an increased fluid loss, due to the fluid loss other body compartments leads to dehydration (polydipsia).

Mechanism of Action of Herbal Antidiabetics

The antidiabetic activity of herbs depends upon variety of mechanisms.

- Adrenomimeticism, pancreatic beta cell potassium channel blocking, cAMP (2nd messenger) stimulation of Phytopharmacology
- Inhibition in renal glucose reabsorption
- Stimulation of insulin secretion from beta cells of islets or/and inhibition of insulin degradative processes
- Reduction in insulin resistance
- Providing certain necessary elements like calcium, zinc, magnesium, manganese and copper for the beta-cells
- Regenerating and/or repairing pancreatic beta cells
- Increasing the size and number of cells in the islets of Langerhans
- Stimulation of insulin secretion
- Stimulation of glycogenesis and hepatic glycolysis
- Protective effect on the destruction of the beta cells
- Improvement in digestion along with reduction in blood sugar and urea
- Prevention of pathological conversion of starch to glucose
- Inhibition of β -galactosidase and α -glucosidase
- Cortisol lowering activities
- Inhibition of alpha-amylase.

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.

Advantages of herbal syrup:

No side effects

No Harmless

Easily available

Easy to adjust the dose for child's weight

No nursing is required, which main and the patient can take it with no help.

Herbs Grow in common place.

It is a preservative by retarding the growth of bacteria, fungi and mould as osmotic pressure.

Good patient compliance

They are more palatable

Disguised the bad taste of medication .

Disadvantages

During storage it causes an crystallization of the sugar within the screw cap.

Not suitable in emergency and unconscious patients .

Delayed onset of action because absorption takes time

INGREDIENTS USED IN HERBAL SYRUP :

Following ingredients are used in Polyherbal antidiabetic syrup are listed below;

A) *Trigonella foenum-graecum*

B) Indian Black jamun seed

C) *Annona Squamous*

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A) *Trigonella foenum-graecum*



It is an annually grown herb which is cultivated throughout the world including Ethiopia. *Trigonella foenum-graecum* is suitable for areas with moderate or low rainfall. It is an erect plant with a height of 30–60 cm, with compound pinnate trifoliolate leaves, auxiliary white to yellowish flowers, and 3–15 cm long thin pointed beaked pods, which contain 10–20 oblong greenish-brown seeds. The medicinal plants provide a useful source of oral antihyperglycemic bioactive compounds for the development of new pharmaceutical clues as well as a good source of dietary supplement to existing therapies. Therefore, the main purpose of this study was to investigate the effect of *Trigonella foenum-graecum* seed powder solution on the lipid profile in newly diagnosed type II diabetic patient. Hypoglycemic effect of Fenugreek seed powder (Trigonella foenum graecum) was studied in 60 non-insulin dependent diabetic patients. A prescribed diet with and without Fenugreek seed powder was given to patients for 7 days of a control period and for 24 weeks of the experimental period. During the experimental period twenty five grams of Fenugreek seed powder divided into two equal doses was added to the diet and served during lunch and dinner diet containing Fenugreek seed powder lowered fasting blood glucose level glucose tolerance. Insulin levels were also diminished.

B) INDIAN BLACK JAMUN SEED



Antidiabetic effect of Jamun has been indicated in Ayurvedic pharmacopeia, which states that the seed powder of Jamun is effective in controlling high blood sugar levels. Jamun has been used to control blood sugar levels for more than 130 years in West however, clinical studies are mixed results. Some of the patients had shown control of blood sugar levels after they have been put on Jamun therapy indicating a good response to the treatment, whereas others did not show any improvement after the treatment.¹⁴ The hypoglycaemic effect of different parts of Jamun to control diabetes in preclinical models have been investigated by several investigators who have shown that Jamun alleviates blood sugar levels. Dried Black Jamun seeds are used to treat diabetes. Active ingredient present in jamun seeds are jamboline and jambosine that slows down the rate of sugar released into the blood and increases the insulin level.

C) ANNONNA SQUAMOSA



Annona squamosa belongs to family Annonaceae, commonly known as sitaphal (Hindi) and custard apple or sugar apple is a native of West- Indies and is now cultivated through out India. Aqueous extract of *Annona squamosa* (A. squamosa) leaf on blood glucose, haemoglobin, glycosylated haemoglobin, plasma insulin, antioxidant enzymes and lipid peroxidation in liver and kidney. The A. squamosa aqueous extract supplementation is useful in controlling the blood glucose level, improves the plasma insulin, lipid metabolism and is beneficial in preventing diabetic complications from lipid peroxidation and antioxidant systems in experimental diabetic in human being; therefore, it could be useful for prevention or early treatment of diabetes mellitus.

EXICIPIENTS :

Propylene glycol
Methyl paraben
Pippermint oil
Amranth
Saccharin sodium
Purified water

Propylene glycol : (stabilizers)

It is viscous, colorless liquid, odorless and has faintly sweet taste. It is commonly used as food additive and drug stabilizer, it helps to preserve moisture in the formulation. Used in medications and cosmetic products. It absorbs extra water and maintains moisture in certain medicines, cosmetics, or food products.

METHYLPARABEN: [Preservative] It is commonly used as “ Preservative” in topical, oral medication ,It prevents the germ growth, used as food preservative and antifungal preservative in food and pharmaceutical industries. Methylparaben is well known for its preservatives action and used mostly in cosmetics food and pharmaceutical industry.

PIPPERMINT OIL: [Flavoring agent] It is an essential oil extracted from the leaves of pippermint plant belongs to mint family, It has sharp odour and refreshing properties and produce coolness feel in our mouth,it is commonly used as flavoring agents in pharmaceutical medications. Concentrated form of pippermint oil can be used for aromatherapyIt is used as pure natural essential oil and it is used as flavouring agent and powerful minty flavor and used in aromatherapy and has refreshing properties.

AMRANTH : [coloring agent]

Amaranth is rich in protein, fibre and calcium.It can be included in weight loss diet as well as It is also a rich source of amino acids.Nontoxic and inactive pharmacologically.

SACCHARIN SODIUM:[sweetener]

Saccharin sodium is an artificial sweetener.It is 500 times sweeter than sugar but no caloric value and be used as a dilute 1% solution. It is stable and non toxic, it is used in preparations for diabetes and in slimming diets.

V. MATERIALS

(Plant materials)

Trigonella foenum-graecum

Syzygiumcumini (Indian black Jamun)

Annona squamosa

Excipients :

Propylene glycol

Methyl paraben

Pippermint oil

Amranth

Saccharin sodium

Purified water

VI. PLANT PROFILE

SR.NO	PLANTS	BIOLOGICAL SOURCE	CHEMICAL CONSTITUENTS	USES
1.	<i>Trigonella foenum-graecum</i>	Fenugreek seed	carbohydrates, proteins, lipids, alkaloids, flavonoids, fibers, saponins, steroidal saponins, vitamins, and minerals, nitrogen compounds	To lower blood sugar levels, reduce painful menstrual periods,

2.	Indian black Jamun	Syzygiumcumini	Ellagic acid, Gallic acid, Myricetin, kaempferol, Oleanolicacid ,Petunidin, Beta – sitosterol, Delphinidin	Used to treat type 2 diabetes mellitus, worm infection, asthma, diarrhoea, cough and cold. It is an anthelmintic, and also used to treat ulcers, dysentery, bronchitis. It purifies blood.
3.	ANNONA SQUAMOSA	<i>CUSTURD APPLE</i>	phenolics, acetogenins, flavonoids, glycosides, steroids, and terpenoid	ailments, thyroid-related disorders, diabetes, and cancer

EXICIPIENTS PROFILE

Sr.no	Ingredients	Uses
1	Propylene glycol	Food additive Drug stabilizer Preservative
2	Methyl paraben	Preservative Antifungal preservative Prevents germ growth
3.	Pipperment oil	Flavouring agent Topical analgesic Anti pruritic
4	Amranth	Coloring agent Dye
5.	Saccharin sodium	Artificial sweetener Low calorie value

VII. METHODOLOGY

Collection of Herbal plant materials:

Annona Squamosa leaves, Trigonella graceum foenum seeds and Indian black jamun seeds were collected from our locality, of our India, The leaves of annona squamosa , seeds of and trigonella graceum foenum were dried about a period of one week to remove moisture, jamun seeds were also dired in a sun shade for 3 days Then the dried leaves and dried seeds were crushed by using a mortar and pistle and it is finely grinded. The finely powdered praticles were sieved by using an sieve no 2.

Preparation of Polyherbal anti-diabetic herbal syrup:

Formulation of Polyherbal syrup (50 ml Formula 1

Table 1:

Sr.no	Ingredients	Quantity
1.	Fenugreek seed powder	
2.	Propylene Glycol	
3.	Methyl paraben	
4.	PIPPERMENT Oil	
5.	Amranth	
6.	Sachharin sodium	
7.	Purified water	

Table 2.

Sr.no	Ingredients	Quantity
1.	Indian black jamun seed powder	10
2.	Propylene Glycol	3
3.	Methyl paraben	2.0
4.	Peppermint oil	1.5
5.	Amranth	0.1
6.	Saccharin sodium	3.0
7.	Purified water	Upto30ml

Table 3.

Sr.no	Ingredients	Quantity
1.	Annona squamosa leaves powder	10
2.	Propylene glycol	3
3.	Methyl paraben	2.0
4.	Peppermint oil	1.5
5.	Amranth	0.1
6.	Saccharin sodium	3.0
7.	Purified water	Upto 30ml

Table 4.

Sr.no	Ingredients	Quantity
1.	Fenugreek seed powder	10
2.	Indian black jamun seed powder	5
3.	Annona squamosal leaves powder	5
4.	Propylene glycol	2.0
5.	Methyl paraben	2.0
6.	Peppermint oil	1.5
7.	Amranth	0.1
8.	Saccharin sodium	2.5
9.	Purified water	Upto30ml

VIII. METHODS OF EXTRACTION

Extraction in chemistry is a separation process consisting of the separation of a substance from a matrix. The distribution of a solute between two phases is an equilibrium condition described by partition theory. This is based on exactly how the analyte moves from the initial solvent into the extracting solvent. The term *washing* may also be used to refer to an extraction in which impurities are extracted from the solvent containing the desired compound.

Maceration.

This is an extraction procedure in which coarsely powdered drug material, either leaves or stem bark or root bark, is placed inside a container; the menstruum is poured on top until completely covered the drug material. The container is then closed and kept for at least three days. The content is stirred periodically, and if placed inside bottle it should be shaken time to time to ensure complete extraction. At the end of extraction, the micelle is separated from marc by filtration or decantation. Subsequently, the micelle is then separated from the menstruum by evaporation in an oven or on top of water bath. This method is convenient and very suitable for thermolabile plant material.

Manufacturing Process :

Step 1 Preparation Extraction of Indian Black Jamun Seed Preparation of extracts The dried seed powder of jamun seed 50 g was macerated with 30%ethanol for 5 days at room temperature. After 5 days, the mixture was filtered and the residue washed by using ethanol and treated for 5 days of the same treatment as before. Solvent was evaporated by rotary evaporator yielding extract of jamun seed is 30ml .

Preparation of Extraction of *Trigonella foenum-graecum*

Preparation of extracts The dried seed powder of *Trigonella foenum graecum* 40 gm was macerated with 2.5 l ethanol 96% for 5 days at room temperature. After 5 days, the mixture was filtered and the residue washed by using ethanol and treated for 5 days of the same treatment as before. Solvent was evaporated by rotary evaporator yielding extract of *Trigonella Foenum graecum* is 30ml.

Step 2:

Preparation of flavor solution: 1.5 ml of pippement oil in 3.0 ml of propylene glycol was prepared separately.

Step 3:

Preparation of simple syrup with sodium saccharin: Mix 3.0 gm of sodium saccharin with 10 ml of distilled water to prepare an concentrated solution, and added to mixing vessel.

Step 4:

Preparation of polyherbalsyrup : Filtrate was taken and added to mixing vessel containing simple syrup, and stir it thoroughly and the add excipients like methyl paraben (2.0gm) , and add the flavor solution to the mixing vessel and finally add an coloring agent Amranth (0.1)ml , and then finally make up the value upto 30 ml with purified water.

Evaluation Parameter

Colour: 5 ml of final syrup was taken in a watch glasses and placed under light , and colour is observed by naked eye.

Odour:

2 ml of final syrup was smelled individually and then the odour can be detected.

Taste:

A pinch of final syrup was placed on the taste bud of tongue to identify the taste.

Determination of pH: Take 5 ml of final syrup in the volumetric flask and make the volume up to 30ml with purified water. The pH can be determined by using digital pH meter.

IX. RESULT AND DISCUSSION

Sr.No	Evaluation parameter	Formulation 1.	Formulation 2.	Formulation 3.	Formulation 4.
1.	Color	Reddish brown	Reddish brown	Reddish brown	Reddish brown
2.	Odour	Aromatic	Aromatic	Aromatic	Aromatic
3.	Taste	Intensity bitter	Lightly bitter	Lightly bitter	Lightly bitter
4.	PH	6.6	6.4	6.5	6.5

X. CONCLUSION

Herbal medicines is still the main stay of about 75-80% for world population mainly in development Countries for primary health care because of better cultural acceptability, better compatibility with human body and lesser side effect. Since from this study we conclude that the Annona Squamosa, Trigonella Foenum Graceum, Syzigium Cumini posses anti-diabetic activity as claimed in the literature survey. The present worker concluded that the formulation containing multiple aqueous herbal extracts for diabetic patients were successfully prepared.

The formulations prepared are unique in it containing natural anti-oxidants for the oxidizable part of extracts. The drugs using in the formulation i.e. Annona squamosa, Trigonella foenum-graecum, syzigium cumini exhibit anti-diabetic activity in in-vitro studies. There is increasing demand by patients to use the natural products with antidiabetic activity. In recent times there has been renewed interest in the plant remedied. Thus the investigated work in this title formulation and evaluation of poly-herbal syrup for anti-diabetic activity will be benefited for entire mankind.

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