DEVELOPMENT AND EVALUATION OF ANTI-DIABETIC HERBAL DRUGS

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ABSTRACT

This terrible illness is widespread around the world and is posing a major threat to human health. It is brought on by the pancreas' insufficient or inefficient secretion of insulin, which causes blood glucose concentrations to rise or fall. Although several medications are available to manage and treat diabetes, complete recovery from the disease has not yet been documented. Numerous herbal plants with hypoglycemic qualities are well-known worldwide as alternatives to these artificial substances. 21,000 plants are identified by the World Health Organization (WHO).They are utilized globally for therapeutic purposes. A list of herbal medications used to treat diabetes as well as medicinal plants with demonstrated antidiabetic and related therapeutic effects is created.
Approximately 60% of people on the planet utilize traditional medicines made from medicinal plants. This article focuses on Indian herbal remedies and plants that are utilized, particularly in India, to treat diabetes. Diabetes is a serious illness that affects people from all backgrounds and nations. It is turning out to be a serious health issue in India, particularly in the cities. Although there are many ways to lessen the negative consequences of diabetes or its secondary complications in herbal formulations are recommended because they are less expensive and have less side effects. A list of herbal medications used to treat diabetes is compiled, along with a list of herbal medicinal plants having demonstrated antidiabetic and related positive properties.

KEY WORD :- Diabetes, Herbal medications, Antidiabetic.

INTRODUCTION

Herbal medicine , also called botanical medicine or phytomedicine , refers to the use of any plant's seeds , berries, roots, leaves, bark , or flowers for medicinal purpose . Long practiced outside of conventional medicine, herbalism is becoming important mainstream as up –to-date analysis and research show their value in the treatment and prevention of disease . In the last few years their has been more potential in the growth in the field of herbal medicines and these drugs are gaining popularity both in developing and developed countries because of their natural origin and organic matter .

A number of medicines plants, traditionally used for over 1000 years named rasayna are present in herbal preparation of Indian traditional health care system . In indian system of medicine most practitioners formulate and dispense their own recipes . The World Health Organisation (WHO) has listed 21000 plants which are used for medicinal purposes around the world . Among these 25000 species are in India , out of which 150 species are used commercially on the large scale . India is largest producer of medicinal herbs and is called as Botanical Garden of World.

The current review focus on herbal drug preparation and plants used in treatment of Diabetes Mellitus . Allopathic drug used for the treatment of diabetes have their own side effect and adverse effect like nausea , vomiting , diarrhoea or constipation and hypoglycemia and hyponatremia flatulence , alcohol flush , headache , weight gain, lactic acidosis, pernicious aneamia, dizziness , dyspepsia , joint pain .

So instead of allopathic drug , herbal drug are great choice which is having more or less no side effect and adverse effects (kokar and menthe, 1998) . Ethno botanical information identified above 800 indian plant which may have antidiabetic potential .All the herbs formulation were proceed from local , authentic herbs supplier shops , specialized in cell of medicinal plant and run by the Ayurvedic specialist as OTC Ayurvedic Medicines. Previous CAM diabetes research has generally focused on single modalities but CAM practitioner more commonly prescribed complex , multi dietary intervention . Ayurvedic interventions may benific patients with higher baseline HbA1c value, warranting for the research (yadav et al 2002).

Diabetes Millatus has become a problem in the contemporary world . India has today become the diabetic capital of the world over 20 millions diabetes and these number is likely to increase 57 million by 2025 . A number of medicinal plant , traditionally used for over 1000 years named Rasayana are present herbal preparation of Indian traditional health care system . The current review focus on herbal drug preparation and plant used in the treatment of diabetis mellitus , a major crippling disease in the world leading to huge economic losses

How do herbs work?

For most herbs, the specific ingredient that cause theraupetic effect is not known. All medicial pant contain many ingredient and chemical that can be use in therapeutic purpose. The type of environment (climate, bugs, soil quality) in which a plant grew will affect its components, as will how and when it was harvested and processed.

How are herbs used ?

For the reasons described in the previous section, herbalists prefer using whole plant rather than extracting single component from them. Whole plant extract how many components. These component work together to produce therapeutic effect. Several herbs are often used together to enhance effectiveness and synergistic action and to reduce toxicity (D'Epiro.,1999).

Herbalists prefer to use whole plants instead of extracting individual components for the reasons outlined in the preceding section. There are numerous components in whole plant extracts. Together, these elements reduce the likelihood of adverse effects from any one component while also producing therapeutic effects. Several plants are frequently combined to increase efficacy, provide synergistic effects, and lessen toxicity (D'Epiro, 1999). When prescribing herbs, herbalists need to consider a number of factors. For instance, the plant's species and variety, habitat, processing and storage methods, and the presence or absence of pollutants (Fugh-Berman, 2000).

What is herbal medicine good for ?

Asthma, eczema, premenstrual syndrome, rheumatoid arthritis, migraine, menopausal symptoms, chronic fatigue, and irritable bowel syndrome are just a few of the ailments that herbalists treat. It is advisable to use herbal medicines under the supervision of a qualified expert. Before self-treating, make sure to speak with your physician or a herbalist.

Herbal Medicines which are good for antidiabetic drug ? -

- **Piper methysticum, or kava kava :-** has gained popularity as a treatment for anxiety. However, the U.S. FDA has issued a warning regarding the use of kava due to reports of liver damage, and other countries, including Germany and Canada, have removed kava from the market.

SYNONYME:- Kawa-Kawa , Intoxicating pepper

BIOLOGICAL SOURCE :- It is the derived from the rhizomes and roots of plant Piper Methysticum G.

FAMILY :- PIPERACEACE

CEMICAL COUNTIUANT :- Kavain ,Dihydrokavain , Methysticin , Yangonin , Desmethoxyyangonin

Uses :- Anxity relief ,Insomnia Tretment ,Muscle relaxation ,Local anesthesia ,Social & ceremonial

Side Effect:- Drowsiness , Digestive Upset , Headaches & Dizziness ,Visual Distrubances

- **Valerian (Valeriana officinalis) :-** Has a long history of being used to induce sleep, and it also has the added advantage of not causing hangovers feeling the following day.

SYNONYME:- Valerine Root, Garden Valerian

BIOLOGICAL SOURCE:- It consist of the dried rhizomes stolons, & root of Valeriana Officinalis Linn.

FAMILY:- Valerianaceae

CHEMICAL CONSTITUENTS:- Volatil Oils(0.2% to 3.8%) , Valerenic acid , Valeprotriates(0.5 % to 2.0%) , Valtrate and Isovaltrate , pyridine Alkaloids , Flavonoids

Uses:- Anxitey& Nervous Tension , Anti-plasmodic , Benzodiazepine Withdrawals

SIDE EFFECT:-Vivid Dream ,Digestive Issues , Headaches , Paeadoxical Reaction

- **Momordica charentia (bitter gourd, Karela) :-** It is made up of fresh green fruits. Momordica charentia is a member of the Cucurbitaceae family. chemical. Chiratin (steroidal saponin) and mimordicin are constituents. In addition to being a nutrient-dense vegetable, momordica charantia is used in traditional medicine to treat type 2 diabetes. It is used in the dish pachadi in Southern India, which is regarded as a curative diet for diabetes. utilized to treat diabetes.Additional applications include stomachic, carminative,tonic, rheumatism, gout, and liver and spleen disorders.

SYNONYME:- Bitter Gourd, Bitter Melon, African Cucumber

BIOLOGIAL SOURCE :- It consists of the fresh or dried fruits, seeds & leaves of Momordica charantia Linn

FAMILY :- CUCURBITACEAE

CHEMICAL CONTITUANTS :- Momordicoside, charantin, Polypeptide-p, Vicinine, vitamice-c

USES:- Mnagment of type 2 diabetes, Antihyperlipidemic, Antimicrobial & Antiviral

SIDE EFFECT:- Hpoglycemica, Gastrointestinal Distres, Headache

1. **Syzygium cumini (jambul, jamun) :-** It is made up of dried seeds and fully ripe Syzygium cumini fruits from the Myretaceae family. chemical. Anthocyanins are constituents. ferulic acid, malvidin-3-laminaribioside, and delphinidine-3-gentiobioside. Jamun is one of the greatest medications for treating diabetes, according to numerous studies. It's an antidiabetic medication. It is recommended that diabetics take one teaspoon of this jamun seed powder in the morning on an empty stomach.

SYNONYME:- Eugenia jambolana , Black Plum

BIOLOGICAL SOURCE:- It is consist of the dried seeds fruits, or bark of Syzygium cumini Skeels

FAMILY:- Myrtaceae

CHEMICAL COUNTITUANT:- Jambosine, Ellagic acid, Anthocyanins, Tannins

Uses:- Antidiabetic, Digestive Health, Antioxidant, Oral Health, Heart Health

SIDE EFFECT:- Gastrointestinal Issues, Constipation, Sore Throat, Body Aches

- **Neem, or Azadirachta indica :-** Azadirachta indica, a member of the Maliaceae family, is the source of neem.Diabetes can be effectively treated with neem leaf extracts and seeds as an active ingredient. According to Shinde and Dhalwal (2009), several studies and research conducted by top medical institutions have demonstrated the high efficacy of neem parts in treating the illness. Many people are being treated with natural neem tablets that are produced and exported all over the world. By widening blood vessels, neem leaf extracts enhance blood circulation and lessen the need for hypoglycemic medications.

SYNONYME:- Mangosa, Indian Lilac, Nim

BIOLOGOCAL SOURCE:- It consists of all aerial parts of the plant Azadirachta indica

FAMILY:- Meliaceae

CHEMICAL CONSTITUENTS:- Nimbidin, Azadirachtin, Tannin, Glycosides, Salannin, Nimbine

USES:- Skin Health, Dental care, Antifungal, Hair care, Agriculture

SIDE EFFECTS:- Pregnancy, Auto-immune Diseases, Toxicity in children

- **Garlic, or Allium sativum**

Garlic, or Allium sativum, belongs to the Liliaceae17 family. A daily dosage of 10 ml/kg of garlic ethanolic extract has been shown to lower blood sugar levels. When compared to garlic extract, the anti-diabetic drug glibenclamide was found to be less effective18.

In rats with diabetes caused by streptozotocin (STZ), it was found that ethyl acetate, ethanol, and petroleum ether extract all had anti-diabetic properties. Garlic has several therapeutic benefits, including anti-platelet, antimicrobial, blood pressure, and cholesterol reduction.

SYNONYME:- Allium, Lashun, Garlic clove

BIOLOGICAL SOURCE:- Garlic consist of the fresh or dride ripe bulbs of Allium sativum

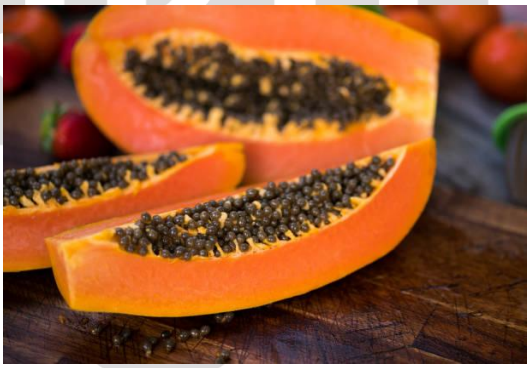
FAMILY:- Amaryllidaceae

CHEMICAL COUNTITUANTS:- Alliin, Allicin, Volatile oil, Ajoene, Minerals, Vitamins

USES:- Caediovascular Health, Antimicrobical, Anti-theombotic, Antioxidant, Expectorant

SIDE EFFECT:- Skin irritation, Bleeding risk, Digestive upset, Drug interaction

- **Papaya carica (Papaya) :**-The papaya tree and its fruit belong to the Caricaceae family. Researchers discovered that extract from the seeds and leaves enhanced glucose and lipid metabolism and accelerated recovery in alloxan-induced diabetic mice using an alloxan model31.



SYNONYME:- Pawpaw, Papita, Carica, Melon Tree

BILOGICAL SOURCE:- It is obtained from the dride latex of the unripe fruit as well as the leaves and seeds of Carica papaya

FAMILY:- Caricaceae

CHEMICAL CONTITUENTS:- Papain, Carpaine, Glycosides,Nutrients

USES:- Digestive Aid, Wound Healing, Anti-helminthic, Anti-inflammatory

SIDE EFFECT:- Pregnancy, Anticoagulant effect, Gastric irritation, skin irritation

- **Aloe vera, or Aloe barbadensis :-**Aloe vera is a common houseplant that has been used for ages as a home treatment for a variety of health issues. The two primary parts of the plant are gel and latex. While aloe latex, sometimes known as "aloe juice," is a bitter yellow secretion from the pericyclic tubules directly beneath the leaf's outer epidermis, aloe vera gel is derived from the pulp or mucilage of the leaf. Aloe gum extracts improve glucose tolerance in rats with and without diabetes20. When administered in long-term dosages, the exudates from Aloe barbadensis leaves showed a hypoglycemic impact on alloxanized diabetic rats.

SYNONYME:- Aloe, Curacao Aloe, Baebados, Kumari

BIOLOGICAL SOURCE:- It consists of the dried juice of the leaves of the Aloe barbadensis

FAMILY:- Liliaceae

CHEMICAL CONTITUENTS:- Barbaloin, Aloin, Vitamins & Minarals

USES:- Laxative, Dermatological, Cosmetic, Dental

SIDE EFFECT:- Abdominal Cramping, Electrolyte imbalance, Pregnancy Breastfeeding

- **Fenugreek or Trigonella foenum graecum :-** It is widely distributed throughout India, and fenugreek seeds are typically one of the main ingredients in Indian spices. In both rats and humans, isolated islet cells released more insulin in response to glucose stimulation when exposed to 4-hydroxyleucine, a new amino acid derived from fenugreek seeds. In both normal and diabetic rats, oral treatment of 2 and 8 g/kg of plant extract resulted in a dose-dependent drop in blood glucose levels. In the heart, skeletal muscle, and liver of diabetic rats, fenugreek seed administration also enhanced glucose metabolism and restored normal creatinine kinase activity. Additionally, it decreased the activity of fructose-1, 6-biphosphatase and glucose-6-phosphatase in the liver and kidneys. Additionally, this plant exhibits antioxidant action

SYNONYME:- Methi, Greek Hay, Trigonella

BIOLOGICAL SOURCE:- It consists of the dried ripe seeds of Trigonella foenum

FAMILY:- Fabaceae

CHEMICAL CONTITUENTS:- Mucilage, Saponins, Alkaloids, Fixed oil, Amino acids

USES:- Diabetes management, Cholesterol control, Digestive Health

SEDE EFFECT:- Uterine contractions, Blood thinning, Allergies Avoid in pregnancy

- **Mangifera indica: (Mango) :-** Although an oral aqueous extract did not change blood glucose levels in either normoglycemic or streptozotocin-induced diabetic rats, the leaves of this plant are employed as an antidiabetic drug in Nigerian traditional medicine. However, when the extract and glucose were given at the same time, antidiabetic efficacy was shown. when the animals received the extract 60 minutes prior to the glucose. The findings show that Mangifera indica aqueous extract has hypoglycemic properties. This could result from a decrease in intestinal glucose absorption.

SYNONYME:- Amra, Sanskrit,Mangot

BIOLOGICAL SOURCE:- It is dired or fresh edible mescosrap and seed of Mangifera indica

FAMILY:- Ancardiaceae

CHEMICAL COUNTITUENTS:- Polyphenol, Carotenoids, Organic acids Volatile oil

USES:- immune support, Herat health, Anti-inflammatory, Antioxidant

SIDE EFFECT:- Blood sugar spikes, Gastrointestinal distress Darmatitis

2. **(Babhul) Acacia arabica :-**It is mostly found in its natural environment in India. By functioning as a secretagogue to release insulin, the plant extract has antidiabetic properties. In control rats, it causes hypoglycemia, but not in animals that have been alloxanized. When given to normal rabbits at doses of 2, 3, and 4 g/kg body weight, powdered Acacia arabica seeds caused a hypoglycemic effect by triggering the release of insulin from pancreatic beta cells.

SYNONYME:- Acacia nilotica, Babhul, Indian gum

BIOLOGICAL SOURCE:- It is dried gummy rxatract or dried bark obtained from the stem and branches of Acacia Arabica Wild

Family:- Fabaceae

CHEMICAL CONTITUENTS:- Arabin, Condensed tannins, Flavonoids

USES:- Demulsant, Astringent, Wound healing, Oral hygiene Binding agent

SIDE EFFECT:-Allergic reactions, Drug Ineractiuon

- **Allium cepa: onion :-**In diabetic rabbits, different ether-soluble and insoluble fractions of dried onion powder exhibit anti-hyperglycemic effect. Additionally, Allium cepa is recognized to have hypolipidemic and antioxidant properties.

  When S-methyl cysteine sulphoxide (SMCS), a sulfur-containing amino acid derived from Allium cepa, was administered to alloxan-induced diabetic rats at a dose of 200 mg/kg for 45 days, the activity of liver hexokinase, glucose 6-phosphatase, and HMG Co A reducase was restored. A single oral dose of 50 g of onion juice considerably reduced postprandial glucose levels in diabetic patients.

SYNONYME :- Onion, Bulb Onion, Garden Onion

BIOLOGICAL SOURCE:- It consists of fresh or dried tunicated of Allium cape linn

FAMILY:- Amaryllidaceae

CHEMICAL CONSTITUENTS:- Allicin, Ally, Flavonoids, Phenolic acids, Chromium

USES:- Caediovascular health, Respiratory support, Antidiabetic, Cosmetic

SIDE EFFECT:- Eye Irritation, Allergic reaction, Drug interaction

- **Ocimum sanctum, or holy basil :-** Tulsi is the popular name for it. This herb has been recognized for its therapeutic qualities since antiquity. Both normal and alloxan-induced diabetic rats' blood sugar levels were significantly lowered by the aqueous extract of Ocimum sanctum leaves. The hypoglycemic and hypolipidemic benefits of tulsi in diabetic rats were demonstrated by a significant decrease in fasting blood glucose, uronic acid, total amino acid, total cholesterol, triglyceride, and total lipid. The plasma glucose level decreased by roughly 9.06 and 26.4% on days 15 and 30 of the experiment, respectively, when plant extract (200 mg/kg) was administered orally for 30 days.

SYNONYME:- Sacred Basil, Tulsi

BIOLOGICAL SOURCE :- It consists of dried or fresh leaves, flowers and whole plant Ocimum sanctum

FAMILY:- Lamiaceae

CHEMICAL CONTITUANTS:- Volatile oil(Eugenol), Flavonoids, Caeyophllene

USES:- Respiratory relief, Antimicrobial, Antipyretic, Oral health Stimulate Nervos system

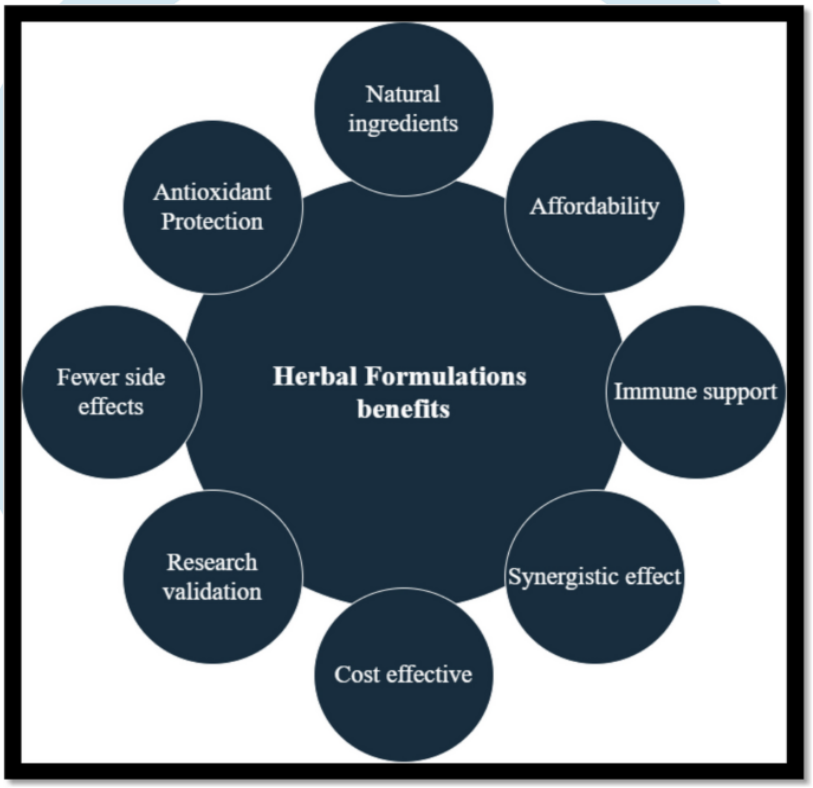
SIDE EFFECT:- Blood thinning, Pregnancy, Fertility.

Objectives : -

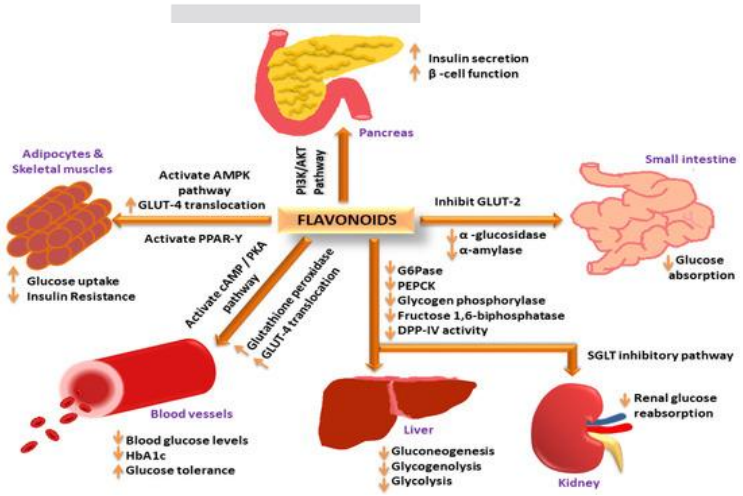
The objective of antidiabetic drug is to treat the diabetis mellitus through the use of herbal drugs .

- Lower the blood glucose level
- Stimulation of pancreatic beta cell
- Prevention of production from live excess glucose
- Reducing of oxidative stress to microvascular & macrovascular damage
- Reduce breackdown of carbohyadrate

BENEFITS OF HERBAL FORMULATION:-



MECHANISUM OF ACTION:-



Advantages:-

1. Fever side effect

Herbal medicine generally have milder side effect than many synthetic antidiabetic drugs like sulfonylureas mateformine

2. Cost-effective

Herbs are often less expensive and more accessible, especially in rural and developing region.

3. Multiple mechanisms of action many herb

Enhance insulin secretion

Improve insulin sensitivity

Provide antioxidant protection

This multi target approach can benefit metabolic disorder like diabetes

4. Natural antioxidant properties many medicinal plants contain flavonoids, polyphenols, and vitamins that help reduce oxidative stress, a major factor in diabetic complications.

5. Useful as adjunct therapy Herbal druges can complimant standard antidibetic medication, improving overall control.

6. Cultural acceptability In many cultures, herbal medicine is trusted, familiar, and commonly used.

7. Lower risk of hypoglycemia (for most herbs)

Unlike some pharmaceutical druges,many herbal preparation do not sharply drop blood sugar.

Disadvantages

1. Lack of standardization Herb potency can vary depanding on:

Plant spacies

Growing conditions

Extraction methods

Dosage form

This affects effectiveness and safety.

1. Limited clinical evidence

Many herbs have promising lab and animal result but few large, well-controlled human studies.

2. Possible drug-herb interaction Herb may interact with antidiabetic druge and cause:
3. Slow onset of action Herbs drugs usually show effects gradually, not as quickly as synthetic medication.
4. Not suitable for severe diabetics Herbs cannot replace insuline in Type1 diabetic or advance Type2 diabetic.
5. Quality control issues contaminaton with heavy metals, pesticides, or auldultration with synthetic druge can occur in poorly regulated herbal product.
6. Incorrect self-medication patients mat use herb without guidance, leading to:Overdose

METHODS AND MATERIALS:-

Materials :-Drugs :- Momordica Charantia , tulsi, Trigonella foenum,azadirachta indica , garlic,sugar apple , onion jamun.
Parts of plant – leaves , seeds , fruits , roots , bark , rhizomes , wood.

SR NO.	INGREDIANTS	QUANTITY
1.	Jamun	13gm
2.	Neem	10gm
3.	Fenugreek	7gm
4.	Amla	4gm
5.	Kerela	4gm
6.	Garlic	2gm
7.	Aleo vera	10gm

Equipment :- mixer & grinder, mortal & pestle , hot air oven , vibrating sieve
Air tight container, weighing balance ,

FORMULATON OF AN ANTIDIABETICS

1. Selection of herbal candidate
   - Study plants which have antidiabetic activity .
   - Firstly choose plant they documented for antidibetic potential.
   - After the selection of accurate plant with combining properties .
   - Dry the separated plants or parts of it.
   - Store it in dry place become contamination it can be occur due moisture .
   - The drugs which can be used as antidiabetic activity are as follow.
     1) Momordica Charantia (bitter melon)
     2) Trigonella Foenum (graecum)
     3) Tulsi (ocimum genus)
     4) Azadirachta Indica (neem)
     5) Garlic (lahsun)

2 .Authentication & standardization of plant material.

- To ensure potency & safty
- To ensure botanical authetification .
- To ensure microscopical & macroscopical analysis .
- To ensure drug are pure in form.
- To determine Ash value , moisture contain , extractive value .
- To Perform analysis like TLC , HPLC ,GC-MS.
- Extraction of active constituents .

3.Extraction of active constituent

a.Choice of extraction method they can depend on their chemistry

- Aqueous extraction ex. Polysaccharides
- Hydroalcoholic extraction ; use for phytochemicals
- Solvent extraction ; ethanol and menthol
- Supercritical CO2 extraction ; for non-polar compounds

b. Extraction steps

- Drying
- Pulverization
- Defatting
- Perculation
- Maceration
- Filteration
- Rotatory evapouration

1.Formulation and development

Depending on the desire doasage form

Powder – collection plant (leaves, seed, bark, etc).

Authentication of their collected plant- Cleaning and drying of raw material then it convert fine powder by using grinder (mixer grinder) and to ensure uniform particle size by sieve method (sieve no.40 or 100). The resulting powder stored in air tide container at room temperature, and prevent from moisture, light, and bacteria.

5.Packaging and Labeling.

- Protect from moisture light heat
- Ensure clear labeling: in their label write dosage composition, batch number.
- Manufacturing date expiry date
- Uses and instruction to take it.

Evaluation of raw Herbal material

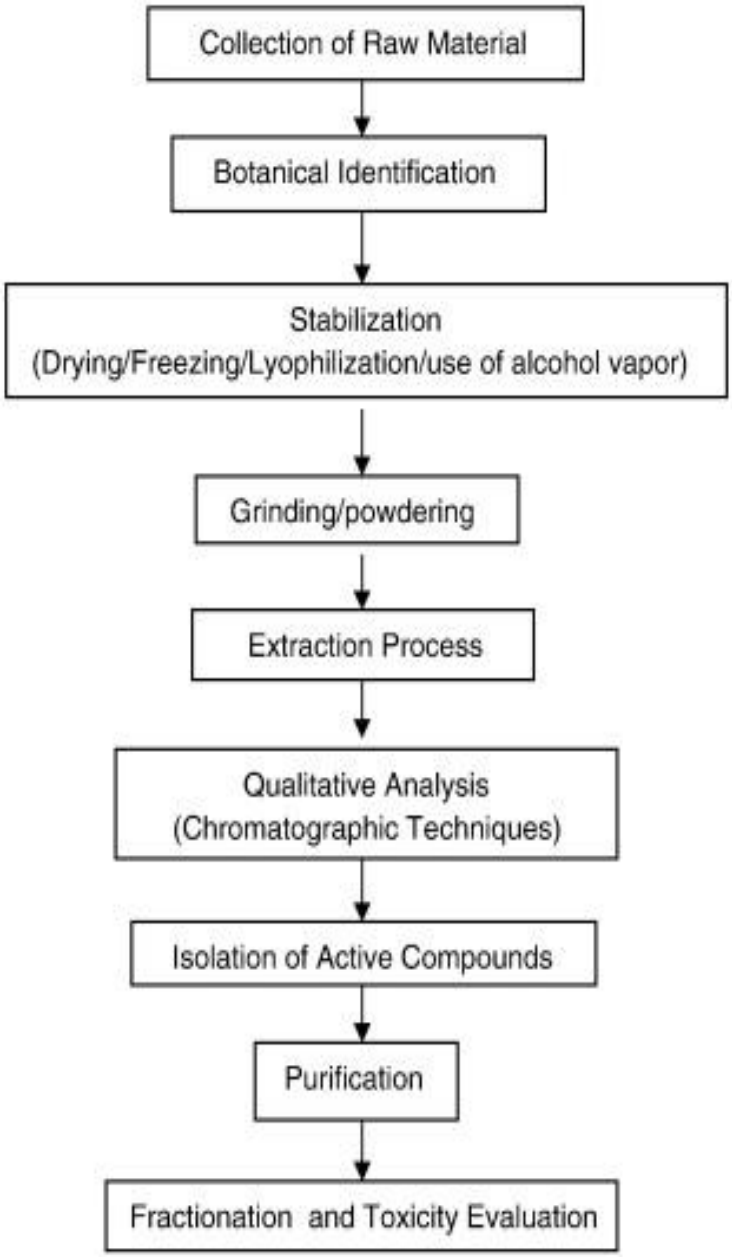
a. Orgenoleptic evaluation
   - Colour
   - Odour
   - Texture
   - Test
   - Appearance
b. Macroscopic and microscopic analysis
   - Powder microscopy
   - Histochemical test
c. Physicochemical parameter
   - Moisture content
   - Total ash
   - Acid soluble ash
   - Alcohol soluble extractive value
   - Water soluble extractive value
d. Qualitative test
   - Alkaloid : mayer's test, Wagner's test, Deagendorff's test, Hager's test, Molish's test.
   - Glycoside: keller-killiani test, libermann's test.
   - Saponine: fronth test.
   - Flavonide
   - Tannins: ferric chloride test, gelatin test.

e. Qualitative estimation

   - Total phenolic content
   - Total flavonoide content

f. Chromatographic studies

   - TLC fingerprinting
   - HPTLC chromatogram
   - HPLC quantification



	ANGLE OF REPOSE	TYPE OF FLOW
1	25º	EXCELLENT
2	25º-30º	GOOD
3	30º-40º	FAIR
4	>45 º	VERY POOR

EVALUATION PARAMETERS

- Angle of repose

By using funnel method, angle of repose was determined. In a funnel,the accurately weighed blend was taken. The funnel height was arranged in a manner that the funnel tip just touches the “apex of the heap” or “head of blend”. Through the funnel “the drug excipient blend” was allowed to flow freely on to the surface. shows the relationship between Angle of Repose and Powder Flow.

The diameter of the powder cone and angle of repose were calculated by using the following equation

$$\text{Tan } \theta = h/r$$

Where h = height of powder cone formed r = radius of the powder cone formed

- Loose bulk density

By pouring a weighed quantity of blend into graduated cylinder and measuring the volume and weight

Loose Bulk Density = Weight of the powder / volume of the packing

- Tapped bulk density

A known mass of drug excipient blend was placed in a graduated cylinder. The cylinder was tapped on to a hard surface from the height of 10 cm at two second interval.Tapping was continued, "until no further change in volume was noted".

Tapped Bulk Density = Weight of the powder / volume of the tapped packing

- Compressibility index

The Compressibility index of the blends was determined by Carr's compressibility index.

Compressibility index (%) = (Tapped Bulk Density-Loose Bulk Density) x 100 / Tapped Bulk Density

Consolidation Flow Index (Carr's index)	Flow
5-15	Excellent
12- 16	Good
18-21	Fair to Passable
23 -35	Poor
33-38	Very poor
<40	Very Very poor

Physical evaluation of Tablets

All the formulated tablets were subjected to following evaluation parameters:

Colour and appearance

For the colour and appearance – "the compressed tablets were examined"

Weight variation test

By randomly selecting and weighing 20 tablets, "the average weight was determined". Individually, each tablet was also weighed. In each case "deviation from the average weight was calculated and expressed as percentage. Not more than two of the tablets from the "sample size" deviate from the average weight by a "greater percentage" and none of the tablets deviate by more than "double that percentage".

Hardness and Friability test

By using calibrated hardness tester (Monsanto) and Roche friabilitor (4 min at 25 rpm) tests respectively, hardness and friability were tested for the tablets.

Disintegration test for tablets

Glass of plastic tube [80-100 mm] long with an internal diameter [28 mm] and external diameter [30-31 mm] fitted at the lower end with a disc of rust proof wire gauge. Six tablets were placed in the tube, the tube was raised and lowered in such a manner that the complete up and down movement was repeated [28 to 32] per min. The tablets were disintegrated when no particle remains above the gauge, which readily pass through mesh (10 mesh screen).

Thickness

The thicknesses of the tablets were evaluated by Vernier calipers

Physical parameters observed were determined below in table

RESULT:-

Preformulation and Micromeritic Properties of Herbal Drug Powder ;-

1. Moisture content

The powder was found to be in the range of **5–8%**, indicating acceptable moisture levels, which are essential for maintaining the stability and shelf-life of herbal materials.

2. Ash value

The ash value was determined to be less than 10%, suggesting minimal inorganic impurities and confirming the purity and quality of the crude drug.

3. Angle of repose

The angle of repose was observed to be 34°, indicating good flow properties, which are suitable for further processing such as granulation or direct compression.

4. Bulk density and Tapped density

The bulk density and tapped density were found to be in the ranges of 0.35–0.55 g/cm³ and 0.45–0.70 g/cm³, respectively. These values suggest good packing ability and compressibility of the powder.

5. Carr's index

The Carr's index was calculated to be between 10–20%**,** indicating good to fair flowability of the powder blend.

6. Hausner's ratio

The Hausner's ratio ranged from 1.12–1.25, further confirming the acceptable flow characteristics of the herbal powder

SR.	PARAMETERS	RESULT	Interpretation
1.	Moisture content	5%-8%	Acceptable
2.	Ash value	< 10%	Low impurity
3.	Angle of repose	34 %	Good flow
4.	Bulk density	0.35 – 0.55g/mg	Good packing
5.	Tapped density	0.45 – 0.70 g/mg	Good compressibility
6.	Carr's index	10%-20%	Good–fair flow
7.	Hausner's Ratio	1.12-1.25	Good flow

CONCLUSION

Herbal items has shown to have potential anti-diabetic properties, offering a non-pharmaceutical alternative to conventional drugs in the treatment of diabetes.

Due to their perceived safety and little side effects, herbal medicines are becoming more and more popular. Many civilizations throughout the world have long used them to treat diabetes. One of the main factors contributing to herbal medicines' effectiveness as anti-diabetic treatments is their capacity to boost insulin production, enhance insulin sensitivity, and reduce insulin resistance.

Positive results in blood sugar control levels imply that using herbal remedies could enhance common anti-diabetic drugs . Additionally, medications provide other health advantages, such as lipid-lowering, anti-inflammatory, and antioxidant attributes, which may be useful for controlling

issues related to diabetes, including oxidative dyslipidemia, inflammation, and stress. But there are difficulties related to using herbal medications for the control of diabetes.

Additionally, interactions between herbal medicines and other treatments may result in side effects or decreased efficacy. The safety and effectiveness of many herbal drugs are not well-established, nor are the long-term advantages on glycaemic control and other diabetes-related outcomes. In conclusion, the anti-diabetic benefits of herbal medicines have been found to be promising, indicating that they may be considered in addition to traditional diabetes treatments.

However, more research is needed to ascertain their dependability.efficacy and optimal use in the treatment of diabetes. It is vital to speak with a medical expert prior to using herbal medications as anti-diabetic medicines, taking into account possible interactions with other drugs and personal health circumstances.Herbal standardization and quality assurance

Products should be guaranteed to be consistently effective and security.

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