FORMULATION AND EVALUATION OF ANTI DIABETIC CHURNA

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Abstract: Diabetes mellitus arises from a lack of insulin production by the pancreas or the body's inability to use the insulin produced effectively. It's a global concern with increasing number affected worldwide. Plants offer a promising avenue for developing hypoglycemic drugs, given the historical use of many plant-derived compounds in diabetes treatment, particularly in systems like Ayurveda. Indian medicinal plants have been extensively studied for their potential in managing diabetes, with numerous reports in scientific literature. This article aims to provide a detailed overview of various plant species native to India and their bio-active components that demonstrate significant hypoglycemic effects. Utilizing herbs for their hypoglycemic properties is a prominent aspect of traditional Indian medicine and warrants further exploration, considering the abundance of literature available in the topic. The paper delves into the chemical composition, activities, and applications of these isolated constituents from Indian plants in diabetes treatment.

***Key Words*: Ayurvedic formulation, Formulation, Physiochemical parameters, Organoleptic evolutions.**

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1. INTRODUCTION

Churna, in Ayurvedic medicine, refers to a finely powdered from of drugs, typically derived from herbs. The ingredients, such as patha, undergo thorough cleaning, drying, pulverizing, and sieving to achieve a free-flowing consistency. When stored in airtight containers, churna maintains its potency for up to a year. Recently , there has been a trend to convert churna into tablets for easier dosage. This form is preferred due to its fine particle size,which enhances absorption in the gastrointestinal tract, leading to increased bioavailability. Ayurvedic physicians commonly prescribe churna for various conditions like diabetes, indigestion, and constipation, Indigestion , a prevalent issue, often treated with antacids in allopathic medicine.

Marketed sample Two samples, Baidyanath Madhumehari Churna (Batch no U.N 20,Mfg- 08/11, Baidyanath Gramodyog Sewa Sansthan) and Shivayu Madhuhari Churna (Batch no CH/3289, Mfg-8/11, Shiv Herbal Research Laboratories), were procured from a local market for comparison with an in-house preparation. This was done to assess their physicochemical properties according to WHO guidelines and reference paper procedures, By obtaining and analyzing these market samples alongside our own formulation, we aimed to evaluate their composition and characteristics to ensure quality and consistency in our product development process.

Diabetes mellitus often manifests through telltale signs such as increased thirst,frequent urination, blurred vision, and unexplained weight loss. In severe cases, it can progress to life threatening conditions like ketoacidosis or a non-ketotic hyperosmolar state, potentially leading to stupor, coma, and even death without prompt intervention. However, symptoms may be subtle or absent, allowing hyperglycemia to persistundetected, causing gradual but significant damage over time. Long-term complications include diabetic retinopathy, which can lead to blindness, nephropathy culminating in renal failure, and neuropathy associated with foot ulcers, amputation risks, Charcot joints, and autonomic dysfunction, including sexual issues. Moreover, individuals with diabetes face elevated risks of cardiovascular, peripheral vascular, and cerebrovascular diseases, emphasizing the importance of proactive management and early detection to mitigate these risks.

Effective diabetes management involves maintaining blood glucose levels as close to normal as possible, addressing any associated blood lipid abnormalities for cardiovascular health, and promoting weight reduction and improved insulin sensitivity through regular physical activity. Individualized programs of regular exercise should be designed based on the person's health status and fitness level. Empowering patients with self-care education is essential, covering blood glucose and body weight monitoring, foot care, personal hygiene, healthy lifestyle choices, target setting, and smoking cessation support. Additionally, oral hypoglycemic therapy can be utilized, including various classes of oral anti-diabetic agents such as biguanides, insulin secretagogues, and alpha-glucosidase inhibitors.

We conducted a preliminary study in plant's potential effects on diabetes. Our research revealed that the ingredients of this plant are easily available in the market and have proven to be therapeutically effective. Moreover , since it is a herbal medicine, it carries minimal to no side effects, making it a safer alternative for managing diabetes. Overall , our finding suggest that this plant could serve as a valuable addition to the arsenal of treatments available for diabetes, offering both efficacy and safety.

2. MATERIAL COLLECTION

Raw material was collected from Om Yogi Ayurvedic Store, Katargam, Surat, Gujrat, 395004. The shop is well known in

Katargam, Varachha and they sell raw herbs as well as formulated ayurvedic and unani medicine.

Ingredients	Quantity(gm)
Gymnema	5 gm
Chickpea	5 gm
Almond	5 gm
Amla	5 gm
Bael	5 gm
Kurchi bark	5gm
Tinospora cordifolia	5gm
Mucuna	2 gm
Fenugreek	5gm
Mango leaf	5gm
Black salt	2 gm

3. METHODS

PREPARATION OF FORMULATION

The preparation process for this formulation involves a systematic and careful approach to ensure the quality and efficacy of the final product. To begin, we follow a precise sequence of steps to ensure uniformity and effectiveness. The first step involves roasting all 12 ingredients individually to enhance their flavor, aroma, and medicinal properties. Roasting not only adds depth to the ingredients but also eliminates any impurities. This careful preparation ensures the formulation's quality and effectiveness.

The process of mixing the 12 ingredients to create a powdered formulation requires careful attention to detail to ensure consistency and efficacy. Firstly, gather all the ingredients in their measured quantities and begin the mixing process by taking 5 grams of amla powder, followed by 5 grams of fenugreek powder. Next, introduce the brown-colored powders: 5 grams each of mango leaf, black berry, bale, and 2 grams of Mucuna. Then, incorporate the green-colored powders: 5 grams each of gymnema and tinospora. Following the green powders, add the white-colored powders: 5 grams each of chickpea, kurchi, and almond. Carefully mix all the powders together for 2 minutes to ensure even distribution and homogeneity. Finally, add salt to taste and blend it thoroughly. Transfer the formulation into an airtight container to maintain its freshness and quality, label the container with pertinent information, and store it in a cool, dry place away from direct sunlight. Following these steps ensures that the powdered formulation is well-mixed, properly preserved, and ready for use, providing health benefits effectively.

EVALUATION TEST

ORGANOLEPTIC PROPERTIES :

Colour : Light brown

Odour : Characteristic

Taste : Slightly bitter

Consistency : Find Powder

3.4.2 PHYSICOCHEMICAL PROPERTIES :

➢ **PHYSICAL PARAMETERS:**

1. BULK DENSITY:

The 10 g powder mixture was precisely weighed and gently poured into a 10 ml glass cylinder without compacting. The volume of the powder mixture was measured and calculated as follows:

Bulk density = m/vo where m denotes mass (g) and VO denotesunsettled apparent volume (cm').

2. TAPPED DENSITY:

To test tapped density, a glass cylinder with a powder mixture from bulk density testing was used. It wastapped for 100 strokes with a tapped density tester. The volume of the tapped powder mixture was measured and the volume was calculated as follows:

Taped density = M/vf where m = mass (g) and Vf = final

3. CARR'S INDEX:

Carr's index, derived from bulk density, gauges powder flow indirectly. Its formula assesses the compressibility and flow-ability of powders, aiding in process optimization and quality control in various industries reliant on powder handling.

% compressibility = (Df-Do/Do) × 100

where Df = Tapped density and Do = Bulk density.

4. HAUSNER'S RATION :

Hausner's ratio, a measure tied to interparticle friction, serves as a valuable predictor for powder flow characteristics. When examining this ratio, we find that powders characterized by low interparticle friction, like coarse spheres, typically exhibit a ratio around 1.2. On the other hand, powders with higher cohesion and reduced flow ability, such as flakes, tend to have Hausner's ratios surpassing 1.6. This metric essentially reflects how easily powders can flow, with lower ratios indicating smoother flow properties, while higher ratios signify a more challenging flow. Therefore, in the context of anti-diabetes churn, understanding Hausner's ratio can aid in selecting or formulating powdered medications with optimal flow properties,

Hausner's ratio = Df / Do ;

where Df = Tapped density and Do = Bulk density.

5. ANGLE OF REPOSE

The angle of repose serves as a fundamental measure for assessing powder flow ability , representing the angle between the horizontal plane and the free surface of a static powder accumulation. This angle stabilizes as additional

powder is added, reflecting a balance between gravitational forces and powder friction. A smaller angle signifies reduced frictional forces and improved flow ability. Typically, powders with an angle of repose at or below 30 are classified as free-flowing, while those at or below 40 demonstrate satisfactory flow ability. However, when the angle surpasses 40 , the powder tends to exhibit poor flow characteristics. Despite its widespread use, the angle of repose's efficacy as a flowability indicator is subject to methodological variations, leading to discrepancies in data interpretation. Notably, its reproducibility is often limited, diminishing its reliability as a sole metric for assessing powder flow. Therefore, while the angle of repose provides valuable insights into powder behavior, it is not universally regarded as a definitive measure of flowability due to interent limitations in its application and interpretation . Observation and calculation :

D1 = 8 cm

D2 = 7.7 cm

D3 = 8 cm

Đ4 = 8.2 cm

D = Diameter of Circle

R = D/2

R1 = 4cm

R2 =3.8 cm

R3 =4 cm

R4 = 4.1 cm

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R = Radius of Circle

Average Radius = RI+R2+R3+R4= 1595 cm = 3.98 cm

1. Height of the pile taken in this practical (H) = 02 cm

2. Average radius of the circle (R) =3.98 cm

3. Angle of repose © = tan' (H/R) = tan '0.50251

4. Result- The Final Angle of Repose is = 26.67.

6. PARTICLE SIZE DISTRIBUTION:

Particle size distribution was determined using the sieve method. The sieves were stacked in order to increase mesh size. The powdered material (churna) was placed on the top sieve and the assembly was shaken for 15 min. After shaking , the sieves were taken a part, and the weight of the churna remaining on each sieve was measured.

➢ CHEMICAL PARAMETERS

1. PH :

The pH of the anti-diabetes churna is determined as 6.1 using 10ml of water mixed with 0.1gm of the formulation. This pH level indicates a slightly acidic nature, contributing to its stability and potential therapeutic efficacy in managing blood sugar levels.

2. MOISTURE CONTENT :

The moisture content analysis of the anti-diabetes churna involves weighing 5gm of the powder with a petri dish , yielding a total wight of 47.56gm. the sample is then subjected to heating at 105-110 C for 10 minutes, repeated thrice at interval, indicating a variation of 0.29gm. this

iterative process ensures accurate assessment of moisture content , vital for product stability and quality assurance.

3. ASH VALUE

Determination of total ash :

The determination of total content in drugs serves as a crucial analytical method for assessing contamination and adulteration. Total ash signifies the inorganic residue left behind post incineration, encompassing naturally occurring salts with in drug or adhering contaminants, such as sand or earth, indicative of adulteration.

Calculation :

weight or empty crucible (A) = 11.53 g

weight or Crucible + Drug (B)= 14.53

weight or Crud Drug = (B-A) =

C = 14.53 - 11.53

C = 0.92

weight or crucible + Ash = [D]

D = 12.48

weight of Ash = [D - A] = E

E = 2.48 - 11.53

E = 0.95

0.95 x100/3

E = 31.66

E = 31 %

Acid insoluble ash :

A subset of total ash identifies contamination from sand or soil. This entails treating the total ash with hydrochloride acid (HCL), boiling the mixture, collecting the residue on ash-less filter papers, washing with hot water, cooling, and weighing the residue.

Weight of acid insoluble ash = X-A = Y =12.20 - 11.53

Y=0. 67 gm

Y= 0.67/3.01*100 = 22.23

Y = 22 %

Observation :

Acid insoluble Value = y gm = 0.67 gm

% Of acid insoluble ash value = 22%.

Result: Total ash value: 86 %

acid - insoluble value = 22 %

Water Soluble Value = 28 %.

Water soluble ash :

Water soluble ash, another component of total ash, gauges the presence of water – soluble salts or improper preparation. The method involves boiling the total ash in distilled water for 5 min, collecting the insoluble residue on ash less filter paper, washing with hot water, igniting, cooling, and weighing. Soluble ash value, offering insights into the extraction of water-soluble salts or preparation accuracy.

procedure :

ash boiled with + 25 ml dis. water

For 5 min

Filter it

weight Crucible + residuals

F = 12.33 gm

weight of water soluble ash =

G= F-A

G : 12.33-11.53

G = 0.8

% Of water-Soluble ash value =G/c*100

= 0.8/3.01*100

H = 26 %

Observation:

Water soluble Ash value: 0.8 gm

% Of water Soluble Ash

water soluble ash value = 26 %

4. EXTRACTIVE VALUE:

Water soluble extractive value:

The procedure described entails preparing a solution from 0.1 grams of an anti-diabetes powder by dissolving it in 10 millilitre's of water, followed by agitation for 5 minutes. Subsequently, the solution is filtered to isolate the residual material, which is then dried. The weight of the residual substance obtained through this process is recorded as 0.08 grams. This method likely aims to assess the solubility or extractable components of the anti-diabetes powder in water, providing insights into its potential pharmacological activity or formulation considerations. The precision in measuring the residual weight suggests a meticulous approach in experimental design, crucial for accurate analysis in pharmaceutical research and development.

4. RESULTS AND DISCUSSION:

PHYSICAL EVALUATION:

No	Parameters	Observation
1	Bulk Density	1.1 gm
2	Tap Density	1.4 gm
3	Car's Index	27 %
4	Hauser's Ratio	1.27
5	Angle of repose	26.67

CHEMICAL EVALUATION:

No	Parameters	Observation
1	pH	6.1
2	Moisture content	0.29%
3	Water soluble Ash value	25%
4	Acid insoluble Ash value	26%
5	Water soluble extractive value	80%

QUALATATIVE TESTS FOR PRIMARY METABOLITES:

No	Test	Observation	Inference
1	Molisch's Test	Reddish violetcolour ring is observed	Carbohydr-ate is confirmed
2	Fehling Test	Brick red precipitates are observed	Reducing sugar is present
3	Benedict's Test	Appearance of green yellow precipitates	Reducing sugar is present
4	Picric acid Test	Blood red colour is observed	Carbohydr-ates is present
5	Benedict Test	Violet colour observed	Protein is present
6	Millon's Test	Red precipitate	Protein is Conform

QUALATATIVE TESTS FOR SECONDARY METABOLITES:

Phytochemical	Test	Observation	Inference
Alkaloids	Mayer's test	Creamy white precipitate isproduced	Alkaloid-s is confirm-ed
	Dragendroff test	Reddish brown precipitate isproduced	
Tannin	Ferric	Blue green	Tannin

	chloride test	colouration	is present
	Lead acetate test	Bulky white precipitate	
Flavonoids	Zinc-Hydroc-hloride test	Red colour after few minutes	Flavon-oids is present
Terpenoids	Salkowas-ki test	Reddish brown coloration atthe interface	Terpen-oids is confir med
Steroid	Salkowas-ki test	Red colour is occurs	Steroid is confirm-ed

5. CONCLUSIONS

Diabetes arises from disrupted carbohydrate, fat, and protein metabolism due to reduced insulin production or increased resistance to its effects. Herbal remedies have been employed in both insulin-dependent and non-insulin-dependent diabetes, as well as complications like retinopathy and neuropathy. Traditional plant medicines, utilized globally, offer promising avenues for managing diabetes.The potential efficacy of botanicals against diabetes underscores their significance in its management. However, despite their reported benefits, these anti-diabetic formulations remain unavailable commercially. Here an attempt is done to prepare an ayurvedic churna formulation for treating diabetics. Initial evaluation tests performed. Shows promising results and in future quantities chemical evaluation and biological evaluation of this churna need be done for its market acceptance.

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