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Review Article

Formulation and Evaluation of Polyherbal Antidiabetic Churna Formulated by Jamun Seeds, Turmeric, and Methi Seeds

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ABSTRACT

Hemorrhoids are a common anorectal disorder characterized by inflammation, pain, and bleeding of the rectal veins. The present study aims to formulate and evaluate a herbal anti-hemorrhoidal cream using extracts of *Ricinus communis* Linn (castor oil) and *Cinnamomum camphora* (camphor). The plant materials were selected for their well-documented anti-inflammatory, analgesic, and wound-healing properties. The cream was prepared by the fusion method using an oil-in-water base. Various formulations were developed and evaluated for physicochemical parameters such as appearance, pH, viscosity, spreadability, homogeneity, and stability. In vitro diffusion studies and antimicrobial tests were also performed to assess drug release and microbial resistance. The optimized formulation showed good consistency, acceptable pH (6.2 ± 0.1), and excellent spreadability with no phase separation upon storage. Pharmacological evaluation demonstrated significant anti-inflammatory and wound-healing activity compared with the standard marketed formulation. The study concludes that the herbal combination of *Ricinus communis* and *Cinnamomum camphora* can be effectively formulated into a topical cream for the management of hemorrhoids with minimal side effects.

INTRODUCTION

The WHO predicts that diabetes will be the 7th leading cause of death in 2030. India leads the world in the number of diabetics who experience the dubious diversity of so-called "diabetic world capital". is increasing worldwide, the prevalence

of type 2 diabetes is rising dramatically, perhaps due to obesity, declining employment rates as countries develop economically and as a result of aging. Over time, diabetes can increase the risk of developing health problems, including blindness, kidney damage, nerve damage, amputation, and cardio vascular disease. Although diabetes cannot

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be cured, the disease can be controlled by non-pharmacological and pharmacological strategies, where the development of glycemic control factors is important factors in delaying the onset and progression of diabetes-related complications. A great way to manage diabetes can be achieved through diet, exercise and / or treatment instead of insulin.

INTRODUCTION OF DIABETES:

Diabetes Mellitus is a long-lasting metabolic condition marked by high blood sugar levels (hyperglycemia). This may happen due to not enough insulin production or the body's inability to use insulin effectively. It is a growing health problem worldwide and a leading cause of illness and death.

2. Types of Diabetes Mellitus



a. Type 1 Diabetes (T1DM)

- This is an autoimmune condition where the immune system attacks the insulin-producing β -cells in the pancreas.
- It is usually diagnosed in childhood or adolescence.
- Lifelong insulin therapy is necessary.

b. Type 2 Diabetes (T2DM)

This is the most common type and is usually caused by insulin resistance and not enough

insulin. It is closely linked to obesity, a lack of physical activity, and an unhealthy diet. It can often be managed with changes in lifestyle, oral medications, and sometimes insulin.

c. Gestational Diabetes Mellitus (GDM)

- This occurs during pregnancy because hormonal changes affect insulin sensitivity.
- It usually goes away after childbirth, but it raises the risk of developing T2DM later in life.

d. Other Specific Types

This category includes genetic defects in β -cell function, pancreatic diseases, or diabetes caused by medications.

3. Pathophysiology

Insulin Role: Insulin is a hormone made by β -cells in the pancreas. It helps regulate blood sugar by encouraging its uptake into cells.

In diabetes, insulin is either not produced (Type 1) or the body's cells resist it (Type 2). This leads to high blood sugar levels, which can harm organs and systems in the body over time.

4. Causes and Risk Factors

- **Type 1 Diabetes:** Autoimmune destruction of pancreatic β -cells and genetic factors.
- **Type 2 Diabetes:**
 - Obesity
 - Sedentary lifestyle
 - Poor dietary habits
 - Genetic factors
 - Aging
- **Gestational Diabetes:**
 - Hormonal changes
 - Obesity
 - A family history of diabetes

5. Symptoms of Diabetes

- Frequent urination (polyuria)
- Excessive thirst (polydipsia)
- Unexplained weight loss
- Fatigue and weakness
- Blurred vision
- Slow wound healing
- Increased risk of infections

6. Complications of Diabetes

If not managed, diabetes can lead to serious health problems:

- **Acute Complications:**
 - Diabetic ketoacidosis (DKA)
 - Hyperosmolar hyperglycemic state (HHS)
- **Chronic Complications:**
 - Microvascular: Retinopathy (eyes), nephropathy (kidneys), neuropathy (nerves)
 - Macrovascular: Heart disease, stroke, peripheral artery disease
 - Others: Diabetic foot ulcers, higher risk of infections, dental issues

7. Diagnosis of Diabetes

Common tests used for diagnosis include:

- Fasting Blood Glucose Test
- Oral Glucose Tolerance Test (OGTT)
- HbA1c Test (Glycated Hemoglobin)
- Random Plasma Glucose Test

8. Management of Diabetes

- **Lifestyle Management**
 - Healthy diet (low glycemic index foods)
 - Regular physical activity
 - Weight management
 - Stress reduction
- **Pharmacological Management**
 - Type 1: Insulin therapy

- Type 2: Oral medications (like metformin and sulfonylureas) and insulin if necessary
- **Alternative & Herbal Therapies**
 - Use of herbs such as Jamun seeds, fenugreek, bitter melon, neem, and Gudmar in traditional practices
 - Focus on diet-based and plant-based strategies
- **Monitoring**
 - Regular blood sugar checks
 - Periodic HbA1c testing
 - Monitoring for complications

9. Prevention of Type 2 Diabetes

- Maintain a healthy body weight
- Eat a balanced diet that is high in fiber and low in refined sugars
- Get regular exercise
- Avoid smoking and limit alcohol consumption
- Regular health screenings for early detection

DRUG PROFILE :-

1. Jamun:-



Fig No. 1 Jamun seeds

Synonyms- Jambolan, Black Plum, Jamun, Java Plum.

Biological Source - The biological source of jamun is the Syzygium cumini tree.

Family- Myrtaceae



Chemical Constituents:- Polyphenols, Flavonoids, Phenolic, Anti-Inflammatory. Anthocyanins, Gallic Acids, Tannins, Phenols, Alkaloids, Ellagic Acid, Glycoside, Isoquercetin, Kaempferol, Myricetin, Tannins.

Uses-

- Jamun's potassium content can help regulate blood pressure
- Jamun can help with digestive issues, such as diarrhea and gas.
- It's rich in vitamins A and C, which can help cleanse the body.
- o Jamun can help manage blood sugar levels
- Jamun can help improve skin health

2. Amla



Fig. No.2:Amla Fruits

Scientific Name - Emblica officinalis

Biological Source - The biological source of amla is the Phyllanthus emblica tree, which is also known as the Indian gooseberry tree.

Family – Phyllanthaceae

3. Methi Seeds:-



Fig No. 3: Methi Seeds

Scientific Name: Fenugreek Seed

Biological Source: The biological source of fenugreek is the dried seeds of the plant Trigonella foenum-graecum

Kingdom: Plantae

Family: Leguminosae (Fabaceae)

Chemical Constituent: Fiber, Protein, and Carbohydrates, as well as minerals like Saponins, Flavonoids, And Alkaloids. Iron, Magnesium, and Manganese contains a variety of nutrients and bioactive compounds.

Uses:

- Ability to regulate blood sugar
- They can increase insulin sensitivity
- Methi seeds can also assist with lowering hdl, or “bad” cholesterol, as well as overall Heart health
- Methi can also assist with weight management, stimulate appetite, and can be used to Relieve menstrual cramping.

4. Turmeric



Fig No.4 Turmeric

Biological Source: Curcuma Longa

Synonym: Termeric , Curcuma Longa

Biological Source: It is the dried rhizome (underground stem) of the plant Curcuma longa. It belongs to the ginger

Family: Zingiberaceae.

Chemical Constituent: Curcuminoids, Curcuminoids consist of curcumin, demethoxycurcumin, and bisdemethoxycurcumin, turmerone, ar-turmerone, and zingiberene.

Uses:

- Antioxident activity
- Cardiovascular and Antidiabetic
- Inflammatory & used in Edematic disorder
- Anticancer & Photo protection activity
- Antimicrobial

5) TULSI:



Fig No. 5 : Tulsi

Synonym: Lamiaceae

Biological Source: The biological source of Tulsi (also known as Holy Basil) is the plant species Ocimum sanctum fresh and dried leaves of this plant are used.

Family: Lamiaceae

Chemical Constituent: Eugenol, Methyl Eugenol, Carvacro, Fatty acids, Terponoids, Flevonoids.

Uses:

- It is widely recognized for its medicinal properties, including its ability to boost immunity,
- Improve respiratory health, reduce stress, and aid digestion.
- Tulsi is used in skincare, oral hygiene, and even as a natural insect repellent)

6) CINNAMON



Fig No. 6 : CINNAMON

Synonym: Ceylon Cinnamon, Cinnamomum Zeylanicum, and Dalchini

Biological Source: The Biological Source of cinnamon bark is the dried inner bark of the shoots of trees belonging to the genus Cinnamomum

Chemical Constituent: cinnamaldehyde, eugenol, cinnamic acid, Cinnamaldehyde, cinnamyl acetate, linalool, and β -caryophyllene.

Uses:-

- It's traditionally used to treat various ailments like colds indigestion, and
- gastrointestinal issues
- Used as anti-inflammatory
- Used as antioxidant, antimicrobial

- To identify the activity of Jamun
- To identify the activity of Amla
- To optimize the ratio of herbal ingredients.
- To research the various biological functions that plants perform.
- To investigate the plant extract cytotoxic or safe properties.
- To ensure the formulation is safe, stable and effective.

MATERIAL & METHODS:

Objectives:-

1. Materials Used

The following raw materials were used in the formulation of the polyherbal churna:

Sr no.	Ingredient Name	Pharmacological Activity
1.	Jamun Seeds	Antioxidant and anti-inflammatory and it improve the sensitivity of insulin
2.	Turneric	Antioxidant and anti-inflammatory property
3.	Amala	anti-inflammatory, antioxidant, and anti-diabetic properties
4.	Cinnamon	anti-inflammatory, antioxidant, and anti-diabetic properties
5.	Tulsi	Hypoglycemic Activity
6.	Methi Seeds	Increase insulin sensitivity

All the raw materials were procured from a certified Ayurvedic herb supplier or local authentic market. Analytical grade chemicals and solvents (ethanol, distilled water, etc.) were used for processing and quality analysis.

2. Instruments and Apparatus Used:

1. Mortar and pestle

2. Grinder (electric pulverizer)
3. Sieve No.60 and No.80
4. Weighing balance (digital)
5. Hot air oven
6. Desiccator
7. Glassware (beakers, measuring cylinders, Petri dishes, etc.)

3. Preformulation study:



Pre formulation study is an important phase in the development of pharmaceutical products. It involves evaluating the characteristics of the drug substance and its compatibility with excipients before creating the final formulation.

- a) Bulk density
- b) Tapped density
- c) Carr's index
- d) Hausner's ratio
- e) Angle of repose
- f) % Ash value
- g) Solubility
- h) Antimicrobial study

a) Bulk Density:

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the inter-particulate void volume.

FORMULA:

$$\text{BULK DENSITY} = \frac{\text{MASS}}{\text{BULK VOLUME}}$$

b) Tapped Density:

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample.

FORMULA:

$$\text{TAPPED DENSITY} = \frac{\text{MASS}}{\text{TAPPED VOLUME}}$$

c) Carr's Index

Carr's Index of any solid is calculated for compressibility of a powder which is based on true density and bulk density.

FORMULA:

$$\text{CARR'S INDEX} = \frac{\text{TAPPED DENSITY} - \text{BULK DENSITY}}{\text{TAPPED DENSITY}} \times 100$$

d) Hausner's Ratio

Hausner ratio is defined as the ratio of a powder's tapped bulk density to its poured (loose) bulk density.

FORMULA:

$$\text{HAUSNER'S RATIO} = \frac{\text{TAPPED DENSITY}}{\text{BULK DENSITY}}$$

e) Angle of Repose

Angle of repose powder poured from a vessel forms a cone-like pile. The angle of repose- the angle between the slope of the pile and the horizontal correlates with the strength of particle-particle interactions and, therefore, is measured to infer flowability.

$$\text{FORMULA: } \Theta = \tan^{-1}(h/r)$$

Where,

h : the height in cm

r : the radius in cm

θ : the angle of repose

f) % Ash Value

The ash values usually represent the inorganic residues such as phosphates, carbonates and silicates present in herbal drugs.

FORMULA:

$$\% \text{ ASH VALUE} = \frac{W_2 - W_0}{W_1} \times 100$$

Where,



W2: weight of crucible ash

WO: weight of crucible

W1: weight of sample

g) Solubility

Solubility is the ability of a solid, liquid, or gaseous chemical substance (referred to as the solute) to dissolve in solvent (usually a liquid) and form a solution. We are going to check solubility of our sample in water, acidic and alkaline solution.

h) Antimicrobial Study

We have to check the antimicrobial property of our sample by using different antimicrobial agents like E. Coli, S. Aureus & Candida albicans.

4. Procedure:-

a. Cleaning

Clean each ingredient to remove foreign matter, dirt, or debris. Use distilled water or dry brushing depending on the nature of the material.

b. Drying

Dry the ingredients in shade or at 40–50°C in a hot air oven until constant weight is achieved. This

prevents loss of volatile constituents (especially for tulsi and cinnamon).

c. Size Reduction

Grind each ingredient separately into fine powder using a pulverizer or grinder. Sieve each powder through 80 sieve to get uniform particle size.

d. Weighing

Weigh all the fine powders according to the predetermined proportion (e.g., as per 100g batch size).

e. Blending

Mix all the sieved powders uniformly using a mortar-pestle or blender. Ensure thorough blending for at least 15–20 minutes to ensure homogeneity.

f. Packaging

Pack the final churna in airtight containers (preferably amber-colored glass jars or food-grade polythene bags). Label with name, batch number, date of manufacture, and expiry date.

5. Evaluation Parameters :

Organoleptic property :

Properties	Observation
Colour	Light Brown
Odour	Characteristics
Taste	Slightly Bitter
Texture	Smooth

pH: pH of freshly prepared 1% w/v suspension and 10% w/v suspension in distilled water was determined using simple glass electrode pH meter

Microbial test : first collect a sample using sterile tools like swabs or bags, then prepare it by diluting it in sterile liquid or solid media. Next, you incubate the sample with a culture medium to encourage microbial growth, or use a filtration



method to isolate and concentrate microbes. Finally, you analyze the results by counting colonies on plates, observing growth in broth, or using more advanced techniques like biochemical tests or microscopy to identify and quantify the microorganisms present.

Ash value : The ash values usually represent the inorganic residues such as phosphates, carbonates and silicates present in herbal drugs

5. Qualitative Test

Test for alkaloids:

Dragendorff's test: To 1 ml of the extract, add 1 ml of dragendorff's reagent (Potassium Bismuth iodide solution). An orange-red precipitate indicates the presence of alkaloids. Mayer's test: To 1 ml of the extract, add 1 ml of Mayer's reagent (Potassium mercuric iodide solution). Whitish yellow or cream-colored precipitate indicates the presence of alkaloids.

Test for saponins:

Take small quantity of alcoholic and aqueous extract separately and add 20 ml of distilled water and shake in a graduated cylinder for 15 minutes lengthwise. A 1cm layer of foam indicates the presence of saponins.

- **Legal test:** Dissolve the extract in pyridine and add sodium nitroprusside solution to make it alkaline. The sodium nitroprusside solution to make it alkaline. The formation

of pink red to red colour shows the presence of glycosides.

- **Baljet test:** To 1ml of the test extract, add 1ml of sodium picrate solution and the yellow to orange colour reveals the presence of glycosides.

Test for Tannins:

About 200 mg of the plant extract was boiled with 10 mL of distilled water; and 0.1% Ferric chloride was added to the mixture; which was then observed for blue-black coloration indicating the presence of tannins.

Test for Flavonoids :

200 mg of the plant extract was mixed with 10 mL of ethanol and filtrated. Two mL of the filtrate, concentrated HCl, and magnesium ribbon were mixed. The formation of a pink or red color indicates the presence of flavonoids. Adding 1 mL of distilled water and NaOH to 0.5 mL of crude extract, the formation of a yellowish color indicated the presence of glycosides.

RESULT AND DISCUSSION

A) Collection Of Sample

Sample is collected from local area of Loha Dist. Nanded 431708

B) Authentication Letter: The sample was authenticated by Dr. Marathe, HOD (botany dept.) of NES Science College , Nanded.





C) Preformulation Study :

Parameter	A(Seive No. 80)	B(Seive No.100)	C Seive No. 120
Bulk Density g/ml	0.50	0.47	0.51
Tapped Density g/ml	0.80	0.68	0.71
Carrs Index %	19.7%	26.5%	17.5%
Hausner's ratio	1.24	1.36	1.21
Angle of Repose	36°5	32°8	34°6
Ash Value	19.8%	12%	17.2%

Table No.3 Preformulation Table of *Syzygium cumini*.

Parameter	A(Seive No. 80)	B(Seive No.100)	C Seive No. 120
Bulk Density g/ml	0.57	0.47	0.51
Tapped Density g/ml	0.71	0.64	0.61
Carrs Index %	37.5%	30.8%	28.1%
Hausner's ratio	1.65	1.44	1.65
Angle of Repose	30°2	32°8	33°6
Ash Value	18.8%	14.1%	16.2%

Table No.4 Preformulation Table of *Emblica officinalis*

Parameter	A(Seive No. 80)	B(Seive No.100)	C Seive No. 120
Bulk Density g/ml	0.38	0.27	0.24
Tapped Density g/ml	0.40	0.37	0.34
Carrs Index %	5%	27.0%	29.4%
Hausner's ratio	1.05	1.37	1.41
Angle of Repose	31°7	31°3	33°6
Ash Value	13.37%	24%	18.2%

Table No.5 Preformulation Table of *fenugreek seed*

In this pre-formulation study of sample, we observed that, the Batch C (sieve #80) has good flow property and other parameters then can be utilized have final preparation of Antidiabetic Churn.



Solubility:-

Ingredients	Solubility in Water	Solubility in ethanol
a) Jamun Seeds	Slightly soluble	Soluble
b) Amla	Slightly soluble	Soluble
c) Methi seeds	Slightly soluble	Soluble

Extraction of samples:

drying by grinding in D.K. Patil Institute Of Pharmacy loha

Extraction of samples (Syzygium cumini , Emblica officinalis , Fenugreek seeds) by Hot air

Formulation Table (25gm of Formulation):

Ingredient	A (gm)	B(gm)	C(gm)
Jamun Seeds Powder	10	13	8
Amla Powder	5	3	8
Methi Seeds Powder	3	2	2
Tulsi Leaves Powder	2	2	2
Turmeric Powder	3	2	3
Cinnamon Bark Powder	2	3	2



D) Phytochemical Test :

Test	Observation	Result
➤ Alkaloid Test		
1) Dragendorff's Test	Orange red colour was obtain	Alkaloid is present
2) Meyre's Test	Creamy white precipitate was formed	Akaloid is present
3) Wagners Test	Radish brown percipitate	Akaloid is present
➤ Flavonoid test		
Sample + few drop of NaOH, dilute HCl	Yellow colour diapper	Flavonoid is present
➤ Tannin		
Sample + Ferric Chloride 2%	Blue-Black or Green Colour	Tannin present
➤ Saponin	Foam is foarming	Saponin is present

**CONCLUSION :**

Based on the research and evaluation, your polyherbal churna formulation offers a promising and natural way to manage a health condition. By combining several medicinal plants, this Churna was designed to be effective while potentially having fewer side effects compared to Modern, synthetic medicines.

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