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Formulation and Evaluation of Polyherbal Antidiabetic Gutika

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Abstract: This study aimed to formulate and evaluate a polyherbal antidiabetic gutika (tablet) using a combination of traditional Indian herbs, including Fever Nut, Vijaysar, Paneer Phul, Gudmar, and T. Arjuna. The gutika was formulated using a blend of herbal extracts and evaluated for its physicochemical properties, antidiabetic potential, and safety.The results showed that the polyherbal gutika exhibited significant antidiabetic activity, as evidenced by improved glucose tolerance and reduced blood glucose levels in experimental models. The gutika also demonstrated promising antioxidant and anti-inflammatory effects. The study concludes that the polyherbal antidiabetic gutika is a potential therapeutic option for managing diabetes mellitus, leveraging the synergistic effects of the selected herbs. Further studies are needed to optimize the formulation and explore its clinical efficacy in human subjects.

Keywords: *Gutika, Antidiabetic, Fever Nut, Vijaysar, Paneer Phul, Gudmar, T. Arjuna.*

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I. INTRODUCTION

➢ *Ghutika***:**

An ancient and traditional ayurvedic dose form, gutika is a product of kalkakalpana, one of the five fundamental principles of ayurvedic sciences. They are very minute in size as compared to vati. According to Acharya Sharangdhargutika is a synonym of vatikalpana which called as pills in modern dosage form.(1) Gutika or pill is defined as the medicine prepared in the form of tablets or pills.Theseare made up of drugs of plants and mineral origin. Medicines prepared in the form of tablet are known as vati or gutika. The effective ayurvedic formula gutika keeps the body's vata and kapha doshas in balance. An ancient and traditional ayurvedic dosage form,gutika is a product of kalkakalpana, one of the five fundamental principles of ayurvedic sciences.

➢ *There Are Two Types of Gutika:*

- Agnisandhya Vati
- Anagnisandhya Vati

✓ *Agnisandhya Vati:*

This gutika is prepared over a fire. Here, the sugar is heated to a high concentration and combined with additional powdered materials to resemble thick glue. The mixture is then moulded into a sphere.

✓ *Anagnisandhya Vati:*

This gutika is prepared without fire by pounding the other powdered components with sugar or guda in the specified liquid medium until they are the right shape.(2)

Diabetes mellitus is an endocrine system metabolic disease. Diabetes is a long-term condition that affects how fat, protein, and carbohydrates are metabolized. It is caused by a total or relative lack of insulin secretion, with or without variable levels of insulin resistance. . Additionally, it can be described as a condition in which the body either stops producing insulin, produces very little of it, or develops growing resistance to its action .Diabetes mellitus is a chronic metabolic disorder that requires comprehensive management. Polyherbal formulations, such as ghutikas, offer a promising approach by combining the therapeutic potential of multiple herbs. This study aims to formulate and evaluate a polyherbal antidiabetic ghutika using a blend of:

- Terminalia arjuna (T. arjuna): Cardioprotective and antioxidant properties.(3)(4)
- Withania somnifera (Paneer phul): Antidiabetic Effect and Antihyperlipidemic activity.(5)(6)
- Vitis vinifera (Vijay sar): Antidiabetic and antioxidant activity.(7)
- Gymnema sylvestre (Gudmar): Traditionally used to support blood sugar management.(8)

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- Caesalpinia bonduc (Fever nut): Anti-inflammatory properties and Antidiabetic effect.[9]

The formulation's potential to manage diabetes will be evaluated through physicochemical analysis, phytochemical screening, antidiabetic activity assays, and safety assessments. This study aims to provide insights into the efficacy and safety of the polyherbal ghutika as an adjunctive therapy for diabetes management.[10]

II. METHOD AND TECHNIQUES

A. Preparation of fine powder of T. Arjuna

Shed dry the bark of t arjuna for 4 to 5 days. Cut the barks into small piece. Crush the piece into fine powder. Pass the powder from sieve no 80. Weight the powder and store in air tight container**.**

Fig 1 T. Arjuna

B. Preparation of fine powder of Panner phul

The tray drying of flowers of Withania coagulans at 55 C for 24 hours. Cut them into pieces and crush into fine powder. Pass the powder from sieve no. 80.Weight the powder and store in air tight container.

Fig 2 Panner phul

C. Preparation of fine powder of Vijaysar

Shed dry the bark of t arjuna for 4 to 5 days.Cut the barks into small piece.Crush the piece into fine powder.Pass the powder from sieve no 80.Weight the powder and store in air tight container.

Fig 3 Vijaysar

D. Preparation of fine powder of Gudmar

Shed dry the leaves of gudmar for 4 to 5 days. Crush the leaves into fine powder. Pass the powder from sieve no. 80. Weight the powder and store in air tight container.

Fig 4 Gudmar

E. Preparation of fine powder of Fever nut

Break the nuts into pieces and dry. Once the moisture is evaporated crush them to fine powder. Pass the powder from sieve no. 80 Weight the powder and store in air tight container.

Fig 5 Fever nut

F. Procedure for Preparation of polyherbal gutika

The raw ingredients used in this experiment, including the medicine, excipients and chemicals came from variety of sources.

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Table 1 Formulation table of Gutika

Sr. No.	Ingridient	F1	F2	F3
1	T.Arjuna	25gm	25gm	25gm
2	Panner phul	12.5gm	12.5gm	25gm
3	Vijaysar	25gm	25gm	25gm
4	Gudmar	25gm	25gm	25gm
5	Fever Nut	12.5gm	12.5gm	25gm
6	Ghee	5gm	7gm	10gm
7	Honey	q.s.	q.s.	q.s.

First formulation is **more stable** than other two formulations

➢ *Procedure*

Mixing: Combine all the sieved herbal powders in a clean, dry mixing vessel. Mix thoroughly to achieve a homogeneous blend.

➢ *Incorporation of Ghee:*

Gently warm the cow's ghee until it becomes liquid. Add the melted ghee to the herbal powder blend. Mix thoroughly to ensure even distribution of ghee throughout the powder.

➢ *Binding with Honey:*

Gradually add honey to the mixture while continuously kneading until a pliable dough-like consistency is achieved. The amount of honey required may vary; add just enough to bind the powders without making the mixture too sticky.

➢ *Formation of Pills (Gutika):*

Divide the prepared mass into equal portions, each weighing approximately 500 mg to 1 gram. Roll each portion into spherical pills using clean hands or a pill-making device.

➢ *Drying:*

Place the formed pills on clean trays lined with parchment paper. Allow them to dry in a shaded, well-ventilated area at room temperature until they harden. Avoid direct sunlight to preserve the potency of the herbs.

➢ *Storage:*

Once completely dried, store the pills in airtight glass containers. Keep the containers in a cool, dry place away from moisture and direct Sunlight.[1]

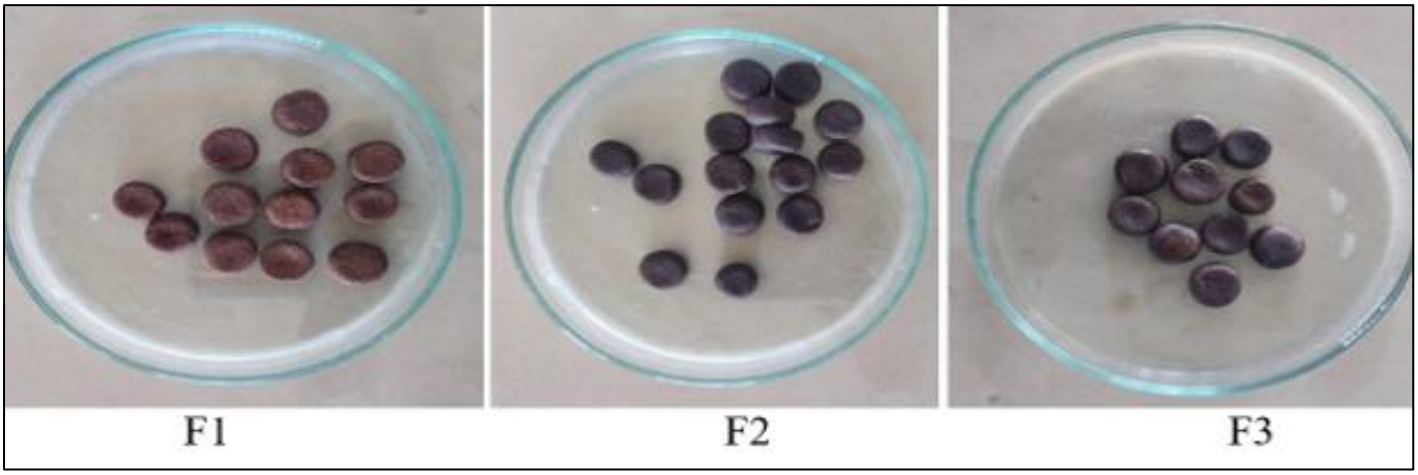

Fig 6 Formulation of Polyherbal Gutika.

➢ *Evalution test:*

- *Organoleptic evaluation*

Table 2 Parameters for organoleptic Evaluation.[5]

Characters	Characteristics
Description	Provide a small description about the gutika
Colour	Identify the colour and matches the standard
Odour	Identify the odour and matches the standard
Taste	Check if the any odour
Size and shape	Check for the shape and size and matches the standard

➢ *Physicochemical evaluation*

- *Hardness*

The force needed to crush a tablet in a diametric compressive test is known as tablet hardness. It stands for the degree of resistance needed to endure mechanical shocks while being handled during the packaging, shipping, and production operations. A Pfizer hardness tester was used to independently assess each tablet's hardness level. The mean hardness of the ten remaining tablets was then calculated.[11]

- *Friability*

The compressed tablet's capacity to resist breaking and cracking during transit is known as friability. Ten pills'

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friability was calculated. Within a plastic cylinder, this device rotates at 25 rpm, reducing the tablets by 6 inches with each rotation while putting them under stress and abrasion. The friabilator was filled with a preweighed sample of tablets and rotated 100 times.(11)

- *Determination of pH Value*

A sample of powder weighing roughly 5 grams was dissolved in 100 milliliters of water in a glass beaker. The beaker had been covered with aluminum foil and kept at room temperature for a whole day. A calibrated electronic pH meter was used to measure the formulation's pH level after the supernatant solution had been transferred to a new beaker.(11)

- *Thickness*

Depending on the brand and model, tablets can vary in thickness. Tablets typically have a thickness of 5 to 10 mm. While tough or specialized tablets may be bulkier for durability or extra functionality, certain ultra-thin devices can be even thinner.(12)

- *Disintegrating Time*

Disintegration is the situation in which there is no tablet residue left on the device's screen. Under the specified experimental conditions, this test ascertains if the tablet dissolves in a liquid medium within the allotted time. Distilled water was added to the disintegration device 27's tank until it reached the desired level. Each of the 1000 ml beakers was filled with 750 ml of distilled water.The instrument's timer was set for 60 minutes. It was maintained that the water in the main tank and the beakers were both at 37°C. Each tube was filled with a disk, and one tablet was inserted. The apparatus was operated while the assembly was suspended in the water-filled beaker. It was noticed how long it took for the tablet to dissolve. If six pills are examined, they should all disintegrate in accordance with USP's established criteria.(12)

- *Weight Variation*

Each of the twenty randomly selected tablets was assigned a distinct weight using a Shimadzu electronic analytical balance. After determining the average weight, the percentage of variance was calculated using the formula below.

Formula Weight Variation = (Iw-Aw)/Aw x 100%

Where,

IW: Individual Weight

AW: Average Weight

As per USP standards, individual weights of two tablets should not deviate from the average weight by 5% and none deviated by 10%.[12]

III. RESULT AND DISCUSSION

A range of physical evaluation factor including Physicochemical evaluation , Hardness, Friability, Determination of pH Value, Thickness, Disintegrating Time , Weight Variation, were applied to the formulations. The following are the outcomes of the same

➢ *Phytochemical test*

Table 3 Phytochemical test and observation

Sr. no.	Test	Observation				
		AqE of T. Arjuna	AqE of Panner phul	AqE of Vijaysar	AqE of Gudmar	AqEof Fever nut
1	Test for flavonoid	+	+	+	+	+
2	Test for tannin	+	+	+	+	+
3	Test for phenolic compound	+	+	+	+	+
4	Test for carbohydrate	+	-	+	+	_
5	Test for triterpenoids	+	+	+	+	+
6	Test for glycoside	+	+	+	-	-
7	Test for alkaloid	-	+	-	-	+
8	Test for saponin	+	+	+	+	+

AqE = Aqueous Extract; + =Present; - = Absent.

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➢ *Evaluation test*

- *Organoleptic evaluation*

Table 4 Organoleptic evolution of gutika.

Characters	F1	F2	F3
Description	Circular gutika with shine	Circular, soft tablets	Shiny, oily in appearance
Colour	Dark brown	Dark brown	Dark brown
Odour	Sweet	Sweet	Sweet
Taste	Sweet	Sweet	Sweet
Size and shape	Circular	Circular	Circular

➢ *Physiochemical Evaluation*

Table 5 Physiochemical evaluation of gutika

Sr.no.	Description	F1	F2	F3
1	Hardness	3.01kg/cm^2	2.25kg/cm^2	1.3kg/cm^2
2	Friability	0.50%	1.1%	0.9%
3	pH value	6.1	6.2	6.1
4	Thickness	0.7	0.7	0.7
5	Disintegrating Time	35 min	28min	26min
6	Weight Variation	0.096gm	0.094gm	0.089gm

The F1 formulation of Gutika has been evaluated through both Organoleptic and physicochemical tests, and the results indicate that it falls within the prescribed limits for acceptable quality parameters:

➢ *Organoleptic Evaluation:*

F1 is described as a circular gutika with a shiny appearance, dark brown in color, and has a sweet taste and odour. The size and shape are circular, aligning with standard expectations.

➢ *Physiochemical Evaluation:*

- Hardness: 3.01 kg/cm² – within acceptable limits.
- Friability: 0.50% – well below the acceptable threshold of 1%.
- pH Value: 6.1 – within the typical range for oral formulations.
- Disintegration Time: 35 minutes – acceptable for gutika-type preparations.
- Weight Variation: 0.096 gm – consistent with permissible variance standards.
- Overall, F1 demonstrates good physical integrity, stability, and uniformity, confirming it is within the prescribed pharmacopoeial limits for herbal tablet (gutika) formulations.

IV. CONCLUSION

The formulation and evolution of the polyherbal antidiabetic Gutika mark a significant step in integrating traditional Ayurvedic knowledge with modern scientific research. Composed of T. Arjuna, Panner Phul, Vijaysar, Gudmar, and Fever Nut each known for their antidiabetic properties. Gutika represents a promising natural alternative for managing blood glucose levels. Preliminary findings suggest that this herbal tablet may act as a safe and effective blood sugar regulator. However, to confirm its therapeutic potential and ensure its safety in human populations, comprehensive clinical trials and toxicological studies are essential. This development emphasizes the importance of validating ancient remedies through rigorous modern methodologies. Gutika's progression not only offers hope for better diabetes management but also showcases the broader potential of herbal formulations to address contemporary health challenges. Continued research and innovation in this area may lead to more effective and accessible treatments rooted in nature.

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