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Development And Evaluation Of A Herbal Formulation With Antidiabetic Potential

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ABSTRACT

The present work involves the Formulation of Antidiabetic Herbal Biscuit. Herbal biscuits have been researched for their potential antidiabetic effects. Some studies have shown that certain herbs, such as fenugreek and cinnamon, which are commonly used in herbal biscuits, may have hypoglycemic (blood sugar-lowering) effects and can help improve insulin sensitivity in individuals with type 2 diabetes. For Formulation of Herbal Biscuit, we used oven and for evaluation we perform quantitative test of Carbohydrates, Protein, Starch, Amino acid. The Evaluation and Formulation of antidiabetic herbal biscuit were performed and it contains carbohydrates, protein, Amino acid and starch.

Keywords: *Formulation, Fenugreek, Antidiabetic, Herbal, Biscuit*

1. INTRODUCTION

Biscuits are a well-liked foodstuff consumed by a good range of population due to low moisture content and free from microbial spoilage, their varied taste, long period, and comparatively low cost. The white flour used for the assembly of biscuits is deficient in several nutrients including some vitamins, mineral elements also dietary fiber. Due to competition within the market and increased demand for healthy, natural, and functional products, attempts are being made to enhance the nutritive value of biscuits and functionality by modifying their nutritive composition for Diabetic patients and non-diabetics [1].

It's also important to keep in mind that herbal biscuits alone may not be sufficient for managing diabetes, and should be used in combination with other lifestyle modifications and/or medication as recommended by a healthcare professional.

Sugar- free biscuits

Sugar-free biscuits are good protein-centric product options. These work great for both adults and children. They carry a number of health benefits. The product has been carefully researched, tested, and produced. These are healthy, organic-friendly biscuits. There are various constituents present in these high-grade protein biscuits. These include vital vitamins, minerals, and Casein protein. These constituents add to maintaining good heart healthy, regulating the blood glucose, help with weight management [2].

Sugar-free biscuits are made from soft dough based on the creaming method and processed in rotary moulder. The biscuits are baked in a continuous tunnel type oven as followed for sweet "gluco" type biscuits. Ordinary "gluco" type biscuits contain about 450 calories and contain 20 - 25% sugar. Sugar-free biscuits do not contain any added sugar.

Benefits of Consuming Sugar-Free Biscuit can provide several health benefits such as: Weight Loss, Reduced Risk of Diabetes, Better Heart Health, Improved Digestion, Boosting Energy, Lowering Inflammations, and Supporting Cognitive Functions [3].

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2. MATERIAL AND METHODS:

Fenugreek, for example, has been shown to lower fasting blood glucose levels and improve glucose tolerance in people with type 2 diabetes. Cinnamon, on the other hand, has been found to lower blood glucose levels and improve insulin sensitivity by increasing the uptake of glucose into cells [4].

Other herbs that may be used in herbal biscuits for their potential antidiabetic effects include ginger, turmeric, and amla (Indian gooseberry). Herbal Biscuits were made by incorporation of Tulshi and Moringa leaves in a. mixture of whole wheat flour, wheat flours, sugar powder, vegetable oil (soybean), dalda, baking powder, skim milk [5].

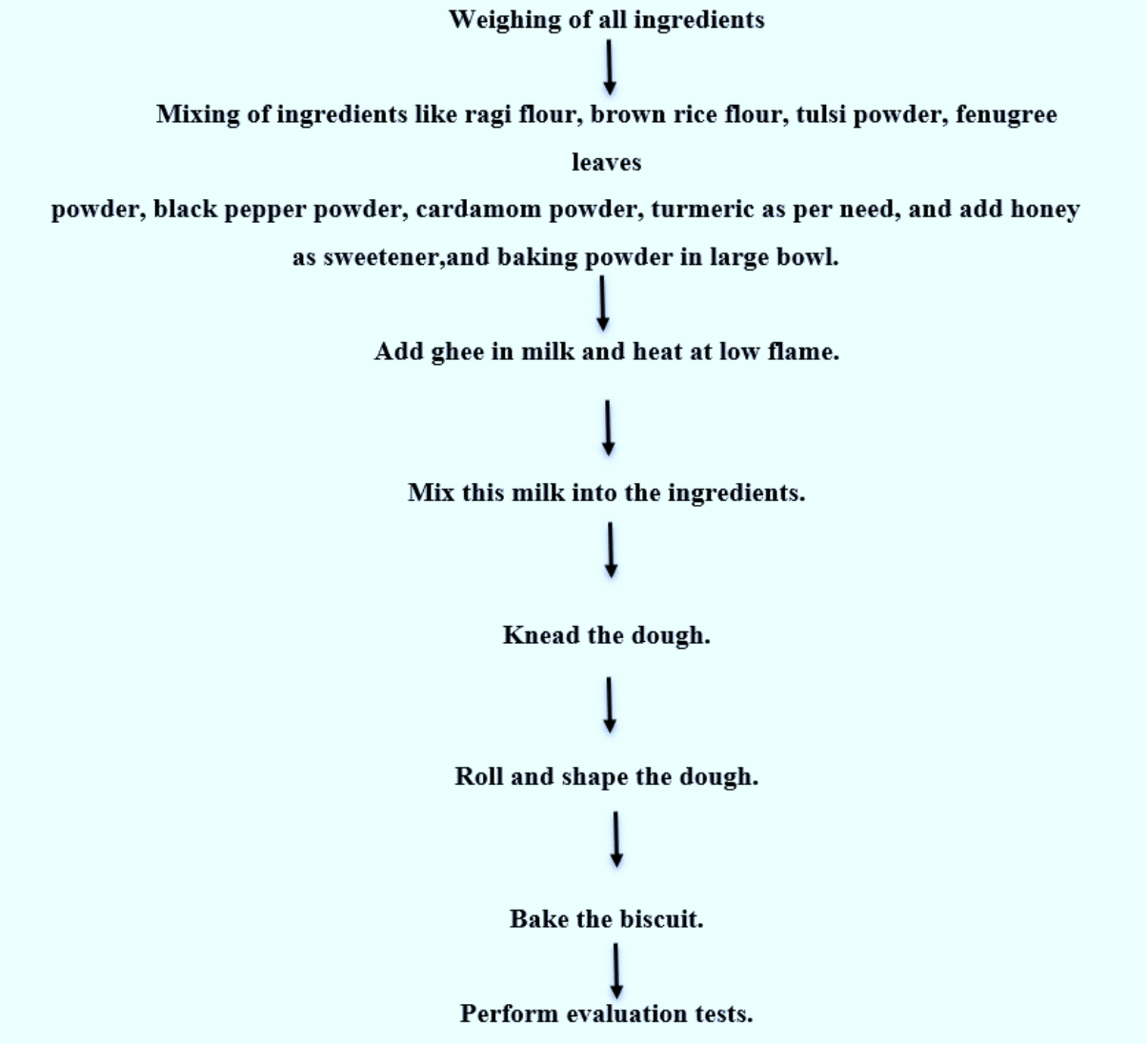


Fig.1. Procedure of Preparation of Herbal Biscuit

Formula:

Batch A		Batch B	
Ingredients	Quantity	Ingredients	Quantity
Brown rice	38 g	Brown rice	38g
Ragi flour	38g	Ragi flour	38g
Tulsi	10g	Tulsi	10g
Black pepper	1g	Black pepper	1g

Almond	15g	Almond	15g
Cardamom	4g	Cardamom	4g
Turmeric	1g	Turmeric	1g
Fenugreek leave	1g	Fenugreek leave	1g
Honey	q.s.	Honey	q.s.
Milk	q.s.		

Characterization Identification of drug

Evaluation Test of Herbal Biscuits was performed for [6, 7];

1. Sensory evaluation: Aroma, Colour, Taste, Texture, Odour
2. Carbohydrates
3. Protein
4. Starch
5. pH
6. Amino acid
7. Microbial Evaluation

Physiochemical Properties of Cookies

Ash value:

Total ash content of the prepared cookies was estimated by following procedure. According to the procedure 1gm of sample was taken in a tarred crucible and it was burnt on Bunsen burner until all the carbon burnt. Then Sample was cooled, weighed and procedure was repeated until weight become constant. After that total Ash value were calculated based on the equation given below [8]:

$$\text{Total Ash Value} = \frac{100\,(Z\text{-}X)}{Y}$$

Where, X=Weigh of empty dish; Y=Weigh of sample taken; Z=Weigh of crucible with sample after complete burn.

Moisture content:

Moisture content was estimated by the method prescribed in the chemical Analysis of food As mentioned in procedure, cookies samples were weighed accurately in a moisture dish and were kept in hot air oven for 2 hours at 105°C and then it was cooled in desiccators and weighed. Process of heating was repeated for 30 min. and again cooled and weighed. This procedure was done until the difference between two successive weighing became less than 0.001 gm. Moisture content in test sample was calculated based on the equation given below [9]:

$$\text{Mositure Percentage} = \frac{(W1\text{-}W2)\times 100}{W1\text{-}W}$$

Where, W1 = Weight of moisture dish with sample before drying; W2 = Weight of moisture dish with sample after drying; W = Weight of moisture dish.

Carbohydrate estimation:

Carbohydrate estimation was done by DGHS Manual method [36]. For estimation of carbohydrate 2 gm of Biscuits powder was taken in a 200 ml of volumetric flask and 50 ml of lead acetate was added. 6 ml of 0.5 N HCl was added and heated on hot water bath. After heating sample were cooled and neutralized with 6 ml of 0.5 N NaOH, finally he sample volume was makeup to 200 ml by using distilled water, Invert sugar was determined before inversion by Lane and Eynon method. According to method 10 ml of mixed Fehling A and B solution was taken in a conical flask and titration was carried out with sample solution within 3 min without inversion by using 1% aqueous Methylene Blue as an indicator [10].

$$\text{Reducing Sugar before inversion} = \frac{F \times 10}{C \times R}$$

Where, C = concentration; R = Reading; F = Factor of Fehling solution

$$\text{Total Invert sugar \% after inversion} = \frac{F \times 10}{C \times R}$$

C = concentration; R = Reading; F = Factor of Fehling solution

$$\text{Total carbohydrate Percentage} = \text{Total Invert sugar \% after inversion} - \text{Invert sugar before inversion} \times 0.95$$

Fat content:

According to the procedure, 2 grams of the cookie sample were stored in a Soxhlet apparatus with a 1:1 mixture of diethyl alcohol and petroleum ether for six hours. The ether was then extracted using distillation and the cookies were dried in a hot air oven at 110 ± 1°C before being chilled in a desiccator. The dried sample was taken and weighed once again. Two to three milliliters of diethyl rand were used to wash the remaining residue, and the procedure was repeated until the weight remained constant [11].

$$\text{\% of Fat Content} = \frac{(M1 - M2)}{\text{weight of the sample}} \times 100$$

Where,

M1 =Weigh of RBF with fat

M2 = Weigh of the RBF

Nutritional analysis: Protein estimation:

Protein estimate was carried out using the method outlined in the DGHS Manual. Using this

Approach, 4 test tubes were filled with 200–300 mg of powdered cookies, and 3 gm of catalyst (K_2SO_4 + $CuSO_4$) was then added. 10 ml of strong sulphuric acid H_2SO_4 was poured to all tubes and then digested for 3 – 4 hrs. These samples were further distilled using 40% sodium hydroxide, boric acid, and potassium permanganate before being acid titrated. The following formula was used to determine the percentage of protein after this titrant was neutralized with ammonia [12].

$$\text{Protein Concentration} = \frac{\text{Amount of sample in } \mu g \times 1000}{V\ (\mu l)}$$

Total Energy:

Total energy was valued on the basis of carbohydrates, proteins and fats content of cookie samples.

Total energy = Carbohydrate × 4 + Protein × 4 + Fat × 9

3. RESULT AND DISCUSSION:

Preliminary Test:

The sensory quality of sugar free biscuit sample was judge by panel of 5 judges. The sample of each trial was evaluated for sensory attributed.

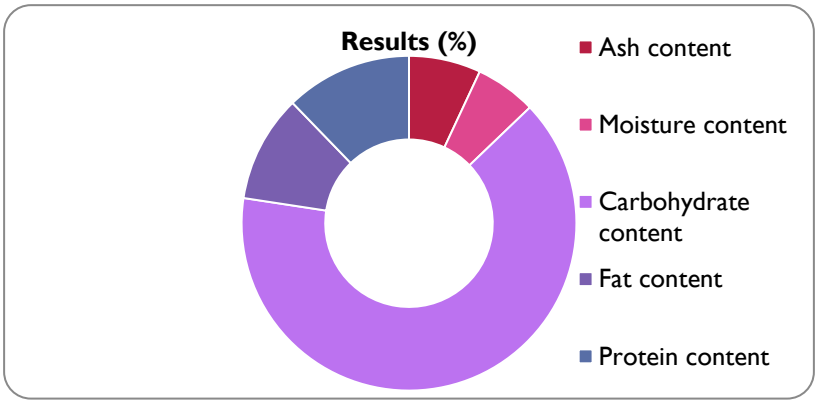
Colour appearance and overall acceptability by an experienced panel.

Table 1: Result of Qualitative Test Performed

Test	Procedure	Observation	Inference
Carbohydrates	Fehling's test	Brick red colour 	Carbohydrates are present
Protein	Biuret test	Pink colour	Protein are present
Amino Acid	Ninhydrin test	Orange colour 	Amino acid present
Starch	Iodine Test	Blue colour	Starch is present
pH	Check the pH of sample	7	Neutral

Table 2: Chemical and physiochemical parameter

Sr. No.	Chemical and Physiochemical Parameter	Results (%)
	Ash content	6.90
	Moisture content	5.85
	Carbohydrate content	64.10
	Fat content	10.28
	Protein content	12.15
	Total Energy	397.52



Formulated Herbal Biscuits:

Fig.2. Formulated Herbal Biscuits

Screening Method for Antidiabetic Potential:

In vitro (lab-based) screening

These initial tests provide a rapid and cost-effective way to identify if a herbal extract has antidiabetic potential by inhibiting key enzymes in carbohydrate digestion and glucose absorption.

Alpha-amylase and alpha-glucosidase inhibition assays: These are the most common in vitro tests for antidiabetic activity.

Principle: Alpha-amylase breaks down starches into smaller sugars (oligosaccharides), and alpha-glucosidase further breaks these into absorbable glucose in the gut. Inhibiting these enzymes delays carbohydrate digestion and glucose absorption, preventing a rapid post-meal rise in blood sugar.

Procedure: Extracts from the herbal biscuits are incubated with the enzymes and their substrates (e.g., starch or p-nitrophenyl-α-D-glucopyranoside). A colorimetric assay is then used to measure the inhibition of enzyme activity compared to a control. The potency is expressed as the IC_{50} value, which is concentration required for 50% inhibition [13].

4. CONCLUSION:

Herbal biscuits have gained popularity as a healthier alternative to traditional biscuits due to their use of natural ingredients and herbs. Some herbal biscuits are specifically marketed as having antidiabetic properties, which has led to interest in their potential as a natural remedy for diabetes.

Several herbs and spices have been studied for their potential antidiabetic properties and are commonly used in herbal biscuits. For example, cinnamon has been shown to improve insulin sensitivity and reduce blood sugar levels in people with type 2 diabetes. Fenugreek has also been shown to have antidiabetic effects by improving insulin secretion and reducing blood sugar levels.

The ingredients used are Brown rice, Ragi floor, Tulsi, Fenugreek leave, Almond, Cardamom, Turmeric and Fehling test, Biuret Test, Ninhydrin test, Iodine Test, pH test were performed and that show carbohydrates, protein, Amino acid and starch are present.

In conclusion, herbal biscuits containing herbs such as cinnamon and fenugreek may have potential antidiabetic effects, but more research is needed to fully understand their effectiveness and safety.

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