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Research Article

Formulation and Evaluation of Hemoglobin Boosting Herbal Biscuit

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ABSTRACT

Iron deficiency anemia remains a major global public health concern, particularly affecting women, children, and vulnerable populations due to inadequate nutritional intake and poor iron bioavailability. This study focuses on the formulation and evaluation of a hemoglobin-boosting herbal biscuit as a functional food approach to combat anemia. The developed biscuit incorporates natural, iron-rich and nutrient-dense ingredients such as wheat flour, ragi, dates, apricot powder, sunflower seeds, jaggery, and tulsi, aimed at enhancing hemoglobin levels and improving overall nutritional status. The preparation involved standard baking procedures followed by physicochemical and textural evaluation, including parameters such as average weight, thickness, diameter, hardness, moisture content, ash value, and color. The formulated biscuits exhibited desirable organoleptic and physical characteristics, including moderate crispness, uniform structure, acceptable moisture content (5–7%), and good mineral composition (ash value 2–3%). The results suggest that the herbal biscuits possess suitable nutritional and functional properties, making them a promising, cost-effective dietary intervention for managing iron deficiency anemia. The incorporation of bioactive compounds and iron-rich ingredients enhances both the therapeutic value and consumer acceptability of the product. Thus, this study supports the potential use of functional foods as a sustainable strategy to reduce anemia prevalence and improve public health outcomes.

INTRODUCTION

The word "Anemia" (derived from the ancient Greek anemia, which means "lack of blood") refers to a collection of disorders caused by body tissues' inability to maintain a normal haemoglobin concentration due to insufficient

supply of one or more nutrients, which lowers the total amount of circulating hemoglobin.

It is one of the most prevalent nutritional disorders worldwide, particularly affecting developing countries and vulnerable populations such as children, adolescent girls, and pregnant women. According to global estimates, a significant

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proportion of the population suffers from anemia, with iron deficiency being the most common underlying cause

Iron deficiency anemia (IDA) arises due to inadequate dietary intake, poor absorption, or excessive loss of iron, leading to reduced hemoglobin synthesis and diminished oxygen-carrying capacity of blood. This condition manifests through symptoms such as fatigue, weakness, dizziness, and decreased cognitive and physical performance, thereby impacting overall quality of life and productivity

Despite various medical interventions, anemia continues to persist as a major public health challenge, especially in low- and middle-income countries.

Biscuit

In recent years, there has been increasing interest in the development of functional foods as a sustainable and cost-effective approach to combat nutritional deficiencies. Functional foods are enriched with bioactive compounds and essential nutrients that provide health benefits beyond basic nutrition. Incorporating iron-rich and nutrient-dense ingredients into commonly consumed food products offers a practical strategy to improve dietary intake and prevent anemia

Biscuits are widely accepted, convenient, and shelf-stable food products that can serve as an ideal vehicle for nutrient fortification. The formulation of herbal biscuits using natural ingredients such as whole wheat, ragi, dates, apricot, sunflower seeds, and tulsi provides a rich source of iron, vitamins, and antioxidants that support hemoglobin synthesis and overall health. These ingredients not only enhance nutritional value but also improve palatability and consumer acceptability.

Therefore, the present study focuses on the formulation and evaluation of hemoglobin-boosting herbal biscuits as a functional food aimed at preventing and managing iron deficiency anemia. This approach emphasizes the use of natural, affordable, and nutritionally enriched ingredients to develop a product that can contribute to improving hemoglobin levels and reducing the prevalence of anemia among vulnerable populations.

Advantages of hemoglobin boosting herbal biscuits

- Improves hemoglobin levels
- Prevents iron deficiency anemia
- Natural and herbal composition, which support overall health without synthetic additives.
- Good source of essential nutrients
- Convenient and ready-to-eat, making it suitable for daily dietary supplementation.
- Affordable and nutrient-dense, making it suitable for populations with limited access to balanced diets.
- Supports child growth and development

MATERIALS

Table no 1:-Materials and their functions

Sr.no	Material	Role in formulation
1	Wheat flour	Provides structure, energy, and small amount of iron
2	Ragi flour	Rich in iron and calcium; supports hemoglobin formation
3	Apricot powder	Source of iron and vitamin C; enhances iron absorption



4	Dates powder	Provides iron and natural sugars; boosts energy and reduces fatigue
5	Sunflower seeds	Contains iron, vitamins, and healthy fats; supports blood health
6	Tulsi powder	Improves iron absorption and protects RBCs with antioxidants
7	Cardamom powder	Enhances flavor and aids digestion
8	Jaggery	Sweetening agent Rich in iron; helps increase hemoglobin levels
9	Butter	Improves texture, taste, and palatability
10	Baking powder	Acts as leavening agent; makes biscuits light and porous
11	Salt	Enhances taste and balances flavor
12	Water	Helps in dough formation and uniform mixing

METHODS AND EVALUATION

method of preparation

- Apricots and dates were thoroughly washed, deseeded, and cut into small pieces, followed by drying in a hot air oven at 50–60°C for 1 hour or sun dried.
- After complete drying, the apricots and dates were finely ground using a grinder and sieved to obtain a uniform powder
- Sieve all powders to remove lumps and obtain uniform particle size.
- All dry ingredients, including whole Wheat flour, Ragi flour, date powder, Apricot

powder, Baking powder, Cardamom powder, Tulsi powder, and salt, were accurately weighed, transferred into a clean mixing bowl, and thoroughly blended to obtain a uniform dry mixture

- Water was added gradually to the dry mixture, followed by gentle mixing and kneading to obtain a soft and smooth dough.
- The dough was kept aside for 20-30 minutes to improve hydration and consistency.
- The dough was rolled into a thin sheet (about 3–5 mm thick) and cut into desired shapes using a biscuit cutter
- Sunflower seeds and apricot seeds were added after shaping biscuit to enhance its nutritional value and to enhance the visual appearance of the final product.
- The oven was preheated to 160–180°C, and the prepared biscuits were placed on a baking tray lined with butter paper and baked for 15-20 minutes until they became light brown and crisp
- The biscuits were removed from the oven and allowed to cool at room temperature to make them crisp.
- Store the biscuits in an airtight container to maintain their quality and freshness.

Formulation Table

Table no.2 :-Formulation table for haemoglobin boosting herbal biscuit

Sr. No.	Ingredients	Quantity (gm) Batch 1	Quantity (gm) Batch 2	Quantity (gm) Batch 3
1	Whole wheat flour	25	30	30
2	Ragi flour	5	5	5
3	Apricot powder	1	2.5	2.5
4	Dates powder	4	5	5
5	Cardamom powder	1	0.5	0.5



6	Tulsi	0.2	0.2	0.2
7	Sunflower seeds	1	1	1
8	Jaggery	5	15	15
9	Baking powder	0.25	0.25	0.25
10	Butter	5	15	15
11	Salt	0.5	1	1
12	Water	27 ml	35 ml	35 ml

Evaluation parameters

1. Texture profile analysis /Textural characteristics of biscuit



Fig no.1:- final product

- Smooth and slightly cracked surface, indicating proper baking
- apricot seeds and sunflower seeds pieces gives a slightly rough and uneven top layer.
- Small visible pores suggest a uniform internal structure
- Appears moderately crisp on the outside due to golden-brown colour.
- Likely to have a slightly firm bite, not too hard
- Looks low in moisture, which is typical for biscuits, contributing to longer shelf life.
- Nut inclusions enhance crunch and sensory appeal.

2. Average weight:- The weight was measured in gram by analytical balance machine



Fig no.2:- Average weight

$$\begin{aligned}
 \text{Average weight} &= 10.2+8.2+10.2+12.7+12.3+10.8 \\
 &= 64.4/6 \\
 &= 10.7 \text{ gm}
 \end{aligned}$$

3. Thickness:- The thickness was measured in mm by digital vernier caliper

= 4.3



Fig no.3:- Thickness

4. Diameter :- The diameter was measured in mm by digital vernier caliper

= 8.7



Fig no.4:- Diameter

5. Hardness:-

Measured using a hardness meter or texture analyzer to evaluate chewiness and texture.

Hardness is defined as the maximum force required to break or compress the biscuit. It indicates the texture quality of the biscuit, such as crispness or softness.



Fig no.5 :- Hardness Tester

6. Moisture content

Determination of amount of water in the sample is called moisture content. 6- cookies are prepared from which 1 is taken out for calculating initial weight, and after air-drying of this same cookie the final weight is calculated.

Moisture content in sample can determine by Oven drying method. Moisture content (%) = $[(X+Y)-Z / Y] 100$

Where, X=Weight in gram of empty dish.

Y=weight in gram of sample.

Z= weight of in gram of the dish with material after drying to constant weight.

=5-7%

7. Ash value

Ash value is important for detecting purity and quantity of total amount of the minerals and thier concentration in formulated samples. Total ash content was determined by Muffle furnace.

Total ash content (% by weight) = weight of ash / total weight of sample

= 2-3%

8. Colour determination

The prepared biscuits exhibit a uniform light to medium brown colour with a slightly golden-

brown surface. This coloration is characteristic of proper baking.

RESULTS

Texture profile analysis :- revealed that the biscuits possessed a smooth and slightly cracked surface, indicating proper baking. The presence of apricot seeds and sunflower seed pieces contributed to a slightly rough and uneven surface, enhancing the product's sensory appeal. They appeared moderately crisp externally with a firm but not hard bite, and the low moisture nature indicated good shelf stability.

Average weight:- of the biscuits was calculated using an analytical balance and was found to be 10.7 g, indicating uniformity in size and preparation.

Thickness :- was measured using a digital Vernier caliper and were found to be 4.3 mm confirming consistency in shaping and processing.

Diameter:- was measured using a digital Vernier caliper and were found to be 8.7 mm .

Hardness test :- was measured using a hardness tester and were found to be 8.7 mm indicated that the biscuits possessed moderate hardness, reflecting a desirable balance between crispness and firmness. This suggests good textural quality suitable for consumption.

Moisture content:- of the biscuits was found to be in the range of 5–7%, which is within the acceptable limit for biscuits and contributes to extended shelf life and prevention of microbial growth.

Ash value :-was determined to be 2-3%, indicating the presence of an appropriate amount of mineral content in the formulated biscuits.

Colour determination :-showed that the biscuits had a uniform light to medium brown colour with a golden-brown surface, confirming proper baking and desirable appearance

SUMMARY

The project aims to develop a hemoglobin-boosting herbal biscuit using natural ingredients like dates, sunflower seeds, apricot powder, and whole wheat to combat anemia in vulnerable populations. The biscuit is formulated to provide bioavailable iron and essential nutrients like vitamin C and folic acid. The study involves evaluating the biscuit physicochemical, nutritional, and therapeutic properties, including texture, color, sensory evaluation, and shelf life. A feeding experiment was conducted to assess the biscuit's efficacy in improving hemoglobin levels and iron status in individuals with iron deficiency anemia.

CONCLUSION

The formulated herbal biscuit shows promise as a nutritious and convenient food product to address anemia in vulnerable populations, such as women and children. The biscuit's iron-rich herbal ingredients, including apricot, dates, and sunflower seeds, provide a natural and bioavailable source of essential nutrients. The evaluation of the biscuit's physical, nutritional, and therapeutic properties demonstrates its potential as a functional food product. Nonetheless, this innovative approach can help alleviate anemia-related health issues in resource-constrained communities.

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