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Formulation and Evaluation of Herbal Nutritive Biscuit to Treat Rheumatoid Arthritis

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ABSTRACT: The study prospects an alternative approach to therapeutic nutrition by development of herbal biscuits. Instead of using conventional formulations, the biscuits were prepared from oats powder rather than refined flour, increasing the overall nutritional form. ROSEHIP (Rosa canina) was selected as the drug of choice due to its anti-inflammatory property, focusing the individuals suffering from arthritis. The powdered form of the drug was evaluated for quality and suitability in the formulation of biscuits. Followed by, the biscuits were evaluated for its sensory and nutritional values. Results indicate that the herbal biscuits prepared from rosehip, afford improved dietary fiber content, positive sensory attributes and probable anti rheumatoid effects. The biscuits are good substitute for health-conscious consumers in terms of both nourishment and health in daily diet.The study aimed to assess shelf life and product acceptability under ambient storage conditions.

KEYWORDS: Biscuits, Arthritis, Sensory Evaluation, Anti-Inflammatory.

I. INTRODUCTION

Biscuits are worldwide admired foodstuff consumed due to their diverse taste, longer shelf life and cost effectiveness.With growing competition in the market and rising interest in the healthier food, people are now focusing on more nutritious biscuits as it provides health benefits like boosting digestion and tackle deficiencies. Morden consumer wants more than just good taste; they also look for safety and nutrition.**[1]**Functional foods have been defined as foods and food components that provide health benefits beyond basic nutrition.**[2]**

Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune disorder, characterized by persistent synovial inflammation, followed byerosion of bones and cartilage, leading to joint destruction.**[3]**

Rosehips are the berry fruits of the dog rose or wild briar rose (Rosa canina L); native to Europe, northwest Africa and western Asia, they are most commonly cultivated in Mediterranean region.Rosehip has been proven to be beneficial in the treatment of various health conditions.**[4]**

Rose hip is used for anti-inflammatory, antioxidant, and cartilage protective effects, particularly in

rheumatoid arthritis.Rosehip is rich in Vitamin C, carotenoids, triterpene acids, flavonoids, polyphenols, and galactolipids.Based on the data,a galactolipid GOPO (1,2-di-O-α-linolenoyl-3-O-β-D-galactopyranosyl-sn-glycerol) found in standardized rosehip powder, has been identified as the key compound responsible for reducing inflammatory activity in human white blood cells without causing toxicity; supported by clinical findings of decreasing the levels of serum C-reactive protein (CRP) and creatinine in arthritis patients.**[4]**

II. OBJECTIVES

Considering this all points the study was caried out with following objectives.

1. To develop a functional food in the form ofbiscuit; enriched with Rosehip as the herbal ingredient.
2. To produce and provide dietary support for patientssuffering from rheumatoid arthritisvia a convenient and palatable form.
3. Utilisation of rosehip for their Anti-inflammatory, antioxidant and pain protective properties inArthritis.
4. Formulation of Nutritionally Balanced Biscuitsusing oats powderand jaggery by replacing refined flour and castor sugar, aiming to enhance the nutritional profile of the biscuits.

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5. To assess the sensory characteristics of the formulated biscuits, including taste, texture, aroma, and overall acceptability.
6. The stability study was performed to evaluate the effect of storage time on thephysicochemical,vitamin c content and sensoryquality of the formulated herbal biscuits containing Rosa canina (rosehip) powder.

III. MATERIAL AND METHOD

The experimental study was carried out in the laboratories of AISSMS College of Pharmacy, Pune. The methodology has been described below:

Raw materials used: -

1. Medicinal plant powder – Rosehip powder {obtained from NATURE HERBS INNOVEDA}
2. Biscuit based ingredients –

Oats powder
Ghee
Jaggery
Gram flour

3. Chemicals and reagents used for evaluation–

Ascorbic acid
Acetone
Methanol
Toluene

Method:-

Organoleptic parameters of rosehip powder -

Colour Light reddish-brown
Odour Characteristic pleasant fruity aroma
Texture Fine, smooth, non-gritty powder
Taste Slightly sweet with mild acidic aftertaste

Physicochemical parameters of rosehip powder-

1) Extractive value

Weigh 1 mg of air-dried powdered rosehip, add 50 ml of solvent in a closed flask. Let it stand for 24 hours, filter the solution and evaporate to dryness in porcelain dish. Weigh and calculate the extractive value using the formula

extractive value
= wt of empty porcelain dish
− wt of porcelain dish with residue

2) Ash value

The total ash, acid insoluble ash and water-soluble ash values of the powdered rosehip were determined as per the WHO guidelines.**[6]**

3) Thin Layer Chromatography

TLC was performed to determine the identification of vitamin C in the rosehip powder extract, using standard ascorbic acid.Vitamin C was detected visually under 254 nm ultraviolet light. **[7]**

Mobile phase used

Acetone:Methanol:Toluene = 1:2:8

The Rf value was calculated using the formula

$$Rf = \frac{\text{Distance travelled by the solute}}{\text{Distance travelled by the solvent front}}$$

Methodology for preparation of biscuits -

a. Preparation of blend

50 grams of ghee were accurately weighed and combined with 55 grams of jaggery. The mixture was stirred thoroughly until a uniform consistency was achieved. In a separate container, 50 grams of oat powder, 20 grams of besan (gram flour), and 20 grams of rosehip powder were mixed together. Finally, both mixtures were blended and mixed well to ensure a consistent and homogeneous blend.

b. Baking of the biscuit

The prepared blend was allowed to cool for 15 minutes at room temperature. Uniform biscuits were then shaped, each weighing approximately 12 grams. These were baked in a hot air oven at a temperature range of 110–120 °C for one hour. After baking, the biscuits were cooled at ambient temperature and subsequently stored in airtight containers to prevent microbial contamination and ensure product stability.

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Fig.1 Flow of preparation

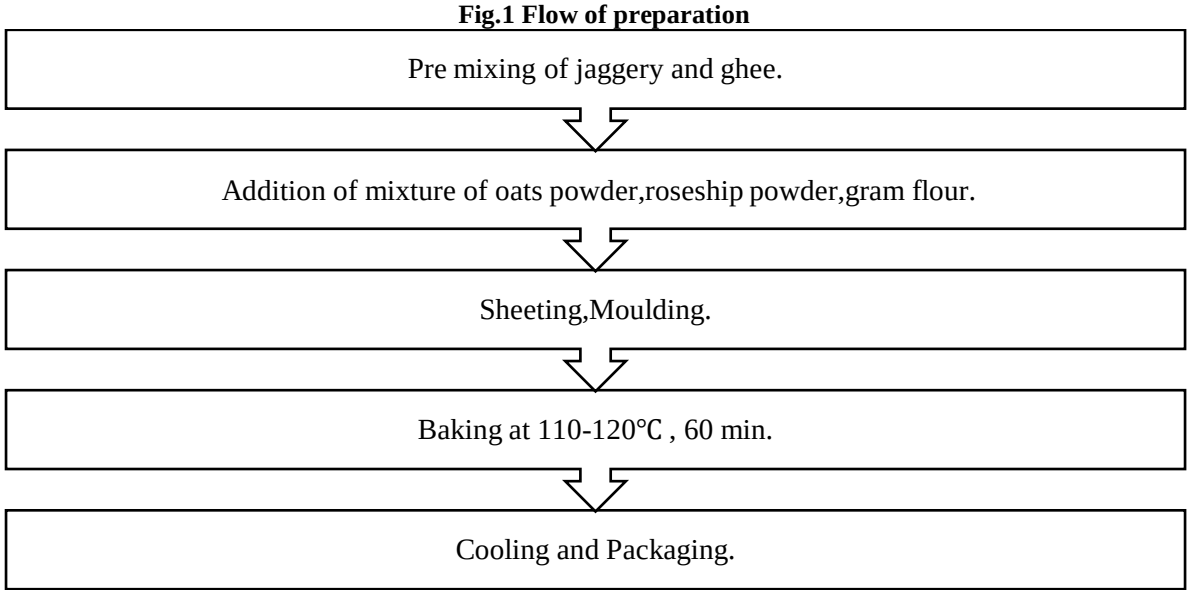

Fig.2 Prepared blend. Fig.3 Molded biscuits

IV. RESULT AND DISCUSSION

A. Physicochemical evaluation of rosehip powder-

Table1A. Extractive value and Ash value of rosehip powder

Water soluble extractive value	2 gm
Alcohol soluble extractive value	1 gm
Total Ash value	4.28 % w/w
Acid insoluble ash value	1.0 % w/w
Water soluble ash value	4.09 % w/w

Table 2A. Rf value from TLC

Vit C from	Rf value
Standard ascorbic acid	0.62
Rosehip powder	0.60

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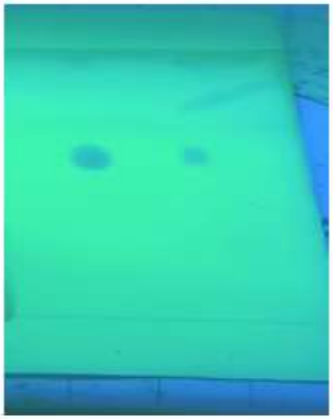

Fig 4. TLC of vit C

Spot A: standard ascorbic acid (left)
Spot B: rosehip powder extract (right)

B. Physical Evaluation of herbal biscuits

Physical characteristics such as thickness, diameter, spread ratio, volume, and density were recorded and are presented in Table 1C.

Table 1B. Physical Parameters of Herbal Biscuits

Sr. No.	Parameter	Result (Mean ± SD)
1	Thickness (cm)	0.60 ± 0.02
2	Diameter (cm)	5.40 ± 0.10
3	Spread Ratio (D/T)	9.00 ± 0.20
4	Volume (cm^3)	14.20 ± 0.40
5	Density (g/cm^3)	0.46 ± 0.02

The results indicate moderate spread and good aeration. The uniform diameter and thickness signify even baking, while the spread ratio and density values show satisfactory textural quality comparable to standard biscuit formulations.

C. Sensory Evaluation

The sensory evaluation of herbal biscuits was carried out using a nine-point Hedonic scale by six panel members. The parameters included colour, appearance, texture, taste, aroma, and overall acceptability. The mean scores are shown in Table 1D.

Table 1C. Sensory Evaluation of Herbal Biscuits

Parameter	Mean Score (± SD)
Colour	7.0 ± 0.4
Appearance	7.0 ± 0.5
Texture	7.0 ± 0.3
Taste	6.8 ± 0.4
Aroma	6.9 ± 0.5
Overall Acceptability	7.1 ± 0.3

The sensory profile revealed that all parameters were rated above 6.5, indicating good acceptability. The pleasant aroma and mild sweetness of jaggery, along with the natural flavour of rosehip, contributed to favourable scores. Texture was found to be crisp and uniform, while colour was appealing due to the light brown hue imparted by jaggery and oats.

D. STABILITY STUDIES

Freshly prepared herbal biscuits were packed in airtight high-density polyethylene (HDPE) containers and stored at ambient temperature (25 ± 2 °C) for 60 days.

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Samples were analysed at intervals of 0 day, 30 days, and 60 days for the following parameters and recorded in Table 1E.

- Moisture content (%)
- Peroxide value (meq O_2/kg fat) — indicator of fat oxidation
- Acid value (mg KOH/g fat) — indicator of rancidity
- Colour, flavour, texture, and overall acceptability (9-point Hedonic scale)

Table1E. Physicochemical Changes During Storage

Parameter	0 Day	30 Days	60 Days
Moisture (%)	3.40 ± 0.15	3.75 ± 0.10	4.20 ± 0.12
Peroxide Value (meq O_2/kg fat)	1.5 ± 0.05	2.3 ± 0.08	3.8 ± 0.10
Acid Value (mg KOH/g)	0.46 ± 0.02	0.55 ± 0.03	0.72 ± 0.04
Color (L* value)	65.4 ± 0.5	64.9 ± 0.4	63.8 ± 0.6
Vitamin C (mg/100 g)	540 ± 10	529 ± 9	518 ± 8

Interpretation: The moisture content (3.40 %) was within the acceptable range for baked biscuits (2–5 %), indicating good shelf stability. Ash content (1.30 %) reflected the mineral contribution from rosehip and gram flour. The fat content (19.8 %) and carbohydrate content (70.25 %) confirmed the energy-rich nature of the formulation. Protein (4.4 %) and fibre (0.85 %) values were slightly higher compared to conventional wheat biscuits due to the presence of oats and gram flour. Vitamin C and total phenolic content were considerably high owing to rosehip powder, confirming the antioxidant potential of the product.A gradual increase in moisture, peroxide, and acid values was observed with time, indicating slow fat oxidation and minor staling. However, all values remained within permissible limits for baked products, signifying good shelf stability.

Table 2E. Sensory Scores During Storage (9-Point Hedonic Scale) [8]

Parameter	0 Day	30 Days	60 Days
Colour	7.0 ± 0.4	6.8 ± 0.5	6.6 ± 0.4
Texture	7.0 ± 0.3	6.8 ± 0.4	6.5 ± 0.4
Flavor	6.9 ± 0.5	6.7 ± 0.4	6.4 ± 0.5
Taste	6.8 ± 0.4	6.6 ± 0.3	6.3 ± 0.3
Overall Acceptability	7.1 ± 0.3	6.8 ± 0.4	6.5 ± 0.3

Interpretation: Slight decreases in sensory attributes were noted after 60 days, mainly in flavour and texture, due to moisture uptake and mild oxidative changes. Nonetheless, overall acceptability remained above 6.5 on the 9-point scale, indicating good consumer perception throughout storage.

V. CONCLUSION

This study successfully developed herbal biscuits using oats and rosehip (Rosa canina) as a nutritious alternative to conventional foods. The biscuits showed improved dietary fibre, pleasant taste, and potential anti-inflammatory benefits, especially for individuals with arthritis. Overall, these herbal biscuits can be a healthy and appealing option for people looking to enhance their daily diet with functional foods.The stability study confirmed that the herbal biscuits retained their nutritional quality, sensory acceptabilityup to 60 days at ambient temperature. Minor increases in moisture and peroxide values were consistent with natural storage changes in bakery products. The retention of more than 85 % of vitamin C after two months reflects good preservation of rosehip bioactives.Hence, the developed herbal biscuit formulation can be safely stored for two months under ambient conditions without significant deterioration in quality or safety parameters.

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