WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

"FORMULATION AND EVALUATION OF IMMUNITY BOOSTING BEETROOT COOKIES"

[1]SONAL SATISH KHANDAGALE,[2] PROF. MANISHA VIRKAR

[1 2] Dr. Babasaheb Ambedkar Technological University, Lonere

ABSTRACT:

This project focuses on the development of immunity-boosting cookies using natural and functional ingredients such as beetroot powder, ashwagandha powder, moringa leaf powder, ragi flour, jowar flour, jaggery, pumpkin seed, sunflower seed and nuts. The aim was to create a healthy, tasty, and nutrient-rich snack that can support the immune system and promote overall wellness.

Three different batches of cookies were formulated and evaluated based on taste, texture, appearance, and nutritional content. Among them, Batch 3 was identified as the most acceptable in terms of sensory properties and overall quality. The inclusion of beetroot provided natural color and iron content, while ashwagandha and moringa contributed to the herbal and immune- supporting properties of the product.

The cookies were packed using food-grade plastic containers with proper labeling for safe storage and easy distribution. The final product is suitable for daily snacking and can serve as a healthier alternative to conventional cookies, especially for health-conscious individuals.

This study demonstrates that it is possible to combine traditional herbs and modern food technology to create a functional, appealing, and market-ready product.

KEYWORDS: Beetroot, Moringa leaf, Ashwagandha, Immunity booster, ragi, nutrition.

AIM AND OBJECTIVE:

AIM: To formulate and evaluate nutritious, immunity-boosting beetroot cookies by incorporating beetroot powder and other functional ingredients.

OBJECTIVE:

- **Enhancing Immune Function:**
  Incorporating ingredients like turmeric, ginger, citrus zest, or honey to support the body's natural defenses.
- **Providing Essential Nutrients:**
  Ensuring a balanced blend of vitamins and minerals like Vitamin C, zinc, and antioxidants that contribute to immunity.
- **Promoting Gut Health:**
  Including probiotics or fiber-rich ingredients like oats, flaxseeds, or chia seeds for digestive well-being, which plays a key role in immunity.
- **Offering a Healthy Alternative:**
  Providing a nutritious snack option that is free from excessive sugar and processed additives while still being delicious.
- **Catering to Special Diets:**
  Making cookies that are gluten-free or free from allergens to ensure accessibility for all.
- **Encouraging Consistent Consumption:**
  Creating enjoyable flavors so people can include them in their regular diet without feeling like they are sacrificing taste for health.

INTRODUCTION:

Urbanization has led to an increase in the consumption of bakery goods, and the food sectors are taking advantage of this trend by producing wholesome and nutritious bakery goods. Cookies are the most popular type of bakery snack food globally. This 'Quick snack' is so popular with customers, that the global cookie market was estimated to be worth 44.01 billion US dollars by 2025.

The term "cookie" refers to "small cakes", and having interesting origin. The word itself is derived from the Dutch word "koekje" or "koekie. Cookies share many ingredients with cakes, but they differ in their proportions. Unlike cakes, cookies have a lower proportion of liquid and a higher proportion of sugar and fat relative to flour. There are many advantages of cookies are Manufacturing Advantages like Efficiency, Variety, Tradition and Technology Blend and Consuming Advantages Energy Boost, Fiber Content, Protein Enrichment, Mood Improvement, Portion Control, Vitamins and Minerals.

The reason cookies are so popular is that they are thought to be an ideal product for value addition, enrichment, or fortification because they are safe, have a long shelf life, and are less expensive. While traditional cookies are cherished for their classic flavors and textures, their nutritional value and sustainability often cause of the limitation that may be addressed by introducing new noble ingredients. The inclusion of noble ingredients with phytochemicals, antioxidants, vitamins, minerals, and resistant starches all of which have the potential to improve human health in a variety of ways can address these shortcoming.

Our immune system helps our body to fight against the any kind of disease, infection, microorganisms, pathogens, etc. The body creates an immune response to protect from foreign body. Several factors can affect immune function including age, stress, and underlying health conditions. Where, for the supporting and maintaining a healthy immune system, the nutrition plays a vital role. For immune cell development and function certain vitamins and minerals are essential. mineral like zinc, selenium, iron etc. and vitamins like A, C, D, E and B-vitamins. The first line of defense against infection is provided by innate immunity. It is a quick reaction that takes minutes but it is not pathogen-specific. It has no memory and does not give the host enduring immunity.

Immunosuppressant drugs are commonly used to treat autoimmune diseases, but they can be expensive and may cause side effects like allergies and drug resistance. In contrast, phytochemicals natural compounds found in plants have shown powerful health benefits, including antioxidant, anti-inflammatory, and immune-boosting effects. Over the past two decades, many studies have explored the healing properties of these plant-based substances.

Drug Profile:

Beetroo:

Fig. 1: beetroot.

Synonyms: Beets, Red Beets, Table Beets.

Biological Source: Root vegetable from the plant Beta vulgaris.

Geographical Source: Originated in Europe and Asia, now cultivated worldwide.

Chemical Constituents:

- Nitrates.
- Antioxidants (betaine, flavonoids).
- Fiber.
- Vitamins (C, folate).
- Minerals (potassium, manganese).

Therapeutical Uses:

- May help lower blood pressure.

- Supports exercise performance.
- Antioxidant properties.
- May have anti-inflammatory effects.
- Supports digestive health.

Ashwagandha:

Fig. 2: Ashwagandha root powder.

Synonyms: Indian Winter Cherry, Withania somnifera.
Biological Source: Plant-based herb, Withania somnifera.
Geographical Source: Native to India and Southeast Asia.
Chemical Constituents:

- Alkaloids.
- 2. Withanolides.
- 3. Saponins.
- 4. Adaptogenic compounds.

Therapeutical Uses:

- Stress relief and anxiety reduction.
- May improve sleep quality.
- Cognitive function support.
- Adaptogenic properties.
- Potential benefits for inflammation and immune system.

Moringa leaf :

Fig. 3: Moringa leaf power

Synonyms: Moring.

Biological Source: Leaves of the Moringa oleifera plant.

Geographical : oleifera, Drumstick leaves.

Source: Native to India and Africa, now cultivated in many tropical regions.

Chemical Constituents:

- Vitamins (A, C, E).
- Minerals (calcium, iron, potassium).
- Antioxidants (quercetin, chlorogenic acid).
- Amino acids.

Therapeutical Uses:

- Rich in nutrients and antioxidants.
- May support heart health.
- Potential anti-inflammatory properties.
- May help regulate blood sugar levels.
- Supports immune system.

Pumpkin seeds:

Fig. 4: Pumpkin seeds.

Synonyms: Pepitas.

Biological Source: Seeds of the pumpkin plant (Cucurbita pepo).

Geographical Source: Native to North America, now cultivated worldwide.

Chemical Constituents:

- Protein.
- Healthy fats (magnesium, zinc).
- Antioxidants.
- Minerals (magnesium, zinc, phosphorus).
- Vitamins (E, K).

Therapeutical Uses:

- Supports prostate health.
- May improve bladder function.
- Rich in antioxidants and minerals.
- Supports immune system.
- May promote healthy sleep.

Sunflower seed:

Fig. 5: Sunflower seed.

Synonyms: None specific.

Biological Source: Seeds of the sunflower plant (Helianthus annuus). Geographical Source: Originated in North America, now cultivated worldwide.

Chemical Constituents:

- Protein.
- Healthy fats (linoleic acid, oleic acid).
- Vitamins (E, B6).
- Minerals (selenium, magnesium, copper).
- Antioxidants.

Therapeutical Uses:

- Supports heart health.
- May help lower cholesterol.
- Rich in antioxidants and vitamin E.
- Supports immune system.
- May promote healthy skin.

MATERIAL AND METHOD:

Ingredient table:

Sr no	Ingredients	Equipment
1	Beetroot powder	Weighing balance
2	Ashwagandha powder	Grinder/mixer
3	Moringa leaf powder	Sieve
4	Ragi flour	Mixing bowl
5	Jowar flour	Oven
6	Jaggery	Baking tray
7	Sunflower seed	Butter paper
8	Pumpkin seed	
9	Butter	
10	Baking powder	
11	Milk	
12	Cardamom	
13	Almond	
14	Walnut	

Table 1: ingredient table for immunity boosting beetroot cookies.

Formulation table:

Sr no.	Ingredient	Batch 1	Batch 2	Batch 3
1	Beetroot powder	20gm	24gm	30gm
2	Ashwagandha powder	10gm	12gm	10gm
3	Moringa leaf powder	10gm	12gm	10gm
4	Ragi flour	100gm	110gm	120gm
5	Jowar flour	100gm	90gm	80gm
6	Jaggery	80gm	45gm	100gm
7	Sunflower seed	10gm	7gm	20gm
8	Pumpkin seed	10gm	7gm	20gm
9	Butter	120gm	55gm	100gm
10	Baking powder	4gm	2gm	4gm
11	Milk	40gm	25gm	60gm
12	Cardamom	2gm	3gm	4gm
13	Almond	20gm	12gm	30gm
14	Walnut	20gm	12gm	30gm

Table 2: formulation table for immunity boosting beetroot cookies.

Method of preparation method:

Step 1: Prepare the Beetroot, Ashwagandha and Moringa leaf, Pumpkin seed, Sunflower seed Powders.

- Grind the Beetroot, Ashwagandha and Moringa leaf, Pumpkin seed, Sunflower seed Powders using a blender or grinder.
- Sift the powders through a strainer or sieve to ensure uniformity.
- Step 2: Prepare the dry mix.
- In a mixing bowl shift the powders of beetroot, ashwagandha, moringa leaf, ragi flour and jowar flour.
- Add the cardamom and baking powder in it.

Step 3: Prepare cream of butter and jaggery

- In another bowl, cream the softened butter and jaggery powder together until smooth and fluffy.
- Whisk for 2 to 3 minutes.

Step 4: Combine both the mixture.

- Slowly add the dry mixture to the creamed butter and jaggery mix.
- Mix gently to form a crumbly dough.

Step 5: Add milk gradually.

- Add milk gradually to bind the dough.
- Knead lightly until you get a soft, pliable cookie dough.

Step 6: Add Nuts and Seeds

- Mix in the chopped almonds, walnuts and powder of sunflower seeds, and pumpkin seeds.
- Fold them into the dough evenly.

Step 7. Shape the Cookies

- Divide the dough into 30 equal portions
- Roll into balls and flatten slightly into discs.
- Place them on a butter paper or lined baking tray, leaving space between each cookie.

Step 8: Preheat Oven

- Preheat your oven to 160–170°C (320–340°F) for about 10 minutes.

Step 9: Bake

- Bake in the preheated oven at 160–170°C for 15–18 minutes or until edges are lightly golden.
- Avoid overbaking; cookies will firm up as they cool.

Packaging:

To package our immunity-boosting beetroot cookies, we use an airtight container to keep them fresh. Here's how we do it: place butter paper at the bottom, add 8-10 cookies, seal the lid tightly, and label the container. This ensures the cookies stay fresh by preventing air and moisture from entering the container. Proper packaging helps maintain the cookies' quality and nutritional value.

Storage:

- Shelf Life: Approx. 30–45 days at room temperature (if stored in airtight packaging).
- Storage Advice: Keep away from moisture, direct sunlight, and heat.

Proper storage helps maintain the quality, freshness, and effectiveness of the immunity boosting beetroot cookies.

Dispensing:

Dispensing our immunity-boosting cookies involves carefully measuring and packing them to ensure each pack has the right amount and maintains consistent quality. This process includes accurately counting the cookies, using good packaging materials to keep them fresh, and labeling each pack with important details like product name, usage, and safety information. This attention to detail ensures our cookies are delivered to customers in perfect condition, ready to provide their health benefits.

EVALUATION AND FORMULATION:

Evaluation of the formulation of immunity-boosting beetroot cookies would involve assessing various factors, such as:

1. **Nutritional Content:**
- Beetroot's nutritional benefits: Antioxidants, fiber, and vitamins, iron, calcium, magnesium, zinc.
- Other ingredients' contributions: Whole wheat flour, nuts, seeds, and spices.

2. **Sensory Evaluation:**
- Taste: Sweetness, earthiness from beetroot.
- Texture: Crunchiness, chewiness.
- Appearance: Color, shape, and presentation.

3. **Functional Properties:**
- Immunity-boosting potential: Beetroot's antioxidants and other ingredients' potential benefits.
- Shelf life: Stability and freshness over time.

4. **Quality Control:**
- Ingredient quality: Sourcing and purity.
- Manufacturing process: Hygiene, consistency, and control.

RESULT:

1.Nutritional content:

Table display the nutritional highlights containing antioxidants, fiber, vitamin, zinc, iron, calcium, magnesium, etc.

Sr no	Nutrients	Source
1	**Antioxidants**	**Beetroot, Moringa, Nuts**
2	**Fibers**	**Ragi, Moringa, Jowar, Seeds**
3	**Vitamin C**	**Beetroot, Moringa**
4	**Iron**	**Beetroot, Moringa, Jaggery**
5	**Calcium**	**Ragi, Milk, Moringa**
6	**Magnesium**	**Seeds, Nuts, Moringa**
7	**Zinc**	**Pumpkin seed, Almond, Walnut**
8	**Adaptogens**	**Ashwagandha**

Table no 3: result of nutrition content for immunity boosting beetroot cookies.

Sensory evaluation:

The table display the sensory evaluation of appearance, texture, flavor, aroma, etc.

Sr no.	Attribute	Score (Avg)	Remark
1	**Appearance**	**8.0**	**Pleasant brownish**
2	**Texture**	**7.5**	**Crispy, slightly nutty crunch**
3	**Flavor**	**7.8**	**Sweet, earthy**
4	**Aroma**	**7.7**	**Nutty, Cardamom**

Table no 4: result of sensory evaluation for immunity boosting beetroot cookies.

Functional properties:

Table display the functional properties like antioxidant activity, flavonoid content, beetroot.

Sr no	Parameter	Observation / Result
1	**Antioxidant activity**	**High**
2	**Flavonoid content**	**Moderate**
3	**Beetroot (betaine)**	**Present**

Table no 5: result of functional property for immunity boosting beetroot cookies.

Quality control:

The table display the physical characteristics of cookies which contain the weight, thickness, diameter, texture, etc.

Sr no.	Parameter	Value/ Range
1	**Weight (gm)**	**20 – 24 g per cookies**
2	**Diameter (cm)**	**5.5 – 6.3 cm**
3	**Thickness (cm)**	**0.5 – 0.7 cm**
4	**Texture (hardness)**	**Moderate crispy**
5	**color**	**Dark brownish**

Table no 6: result of physical characters for immunity boosting beetroot cookies.

The development of immunity-boosting cookies using beetroot powder, ashwagandha, moringa leaf powder, and other nutritious ingredients was successfully completed in three batches. Each batch was tested for taste, texture, nutritional value, and acceptability. The third batch was finalized as the best formulation.

Fig. 6: the immunity boosting beetroot cookies.

CONCLUSION:

The final batch of immunity-boosting cookies, formulated using beetroot powder, ashwagandha, moringa leaf powder, ragi flour, jowar flour, and other natural ingredients, was found to be the most successful in terms of taste, texture, appearance, and nutritional value.

The cookies were rich in natural antioxidants, vitamins, and minerals, which help in enhancing immunity, improving digestion, and providing sustained energy. The combination of beetroot, known for its iron and nitric oxide content, along with ashwagandha (a powerful adaptogen) and moringa (rich in vitamin C and calcium), makes these cookies a functional food product supporting overall wellness, especially in today's health-conscious world.

REFERENCE:

1. S. Jayakumari et al. (2024) Formulation and evaluation of polyherbal cookies for immunity booster Annals of Phytomedicine 13(1): 1252-1258.

2. Shetal B. Desai et al. (2024) Formulation and Evaluation of Herbal cookies containing Moringa LeavesInt. J. of Pharm. Sci., 2024, Vol 2, Issue 5, 1598-1606.

3. Dr. Lovelin Jerald et al. (2022) Development and Quality Evaluation of Herbal Cookies fortified with Ashwagandha (Withania somnifera) Root Powder IJNRD | Volume 7, Issue 5 May 2022 | ISSN: 2456-4184.

4. Anuska Dey et al. (2023) A review on the analysis of nutritional composition of beetroot powder The Pharma Innovation Journal 2023; 12(6): 665-671.

5. Mumtaz Ahmad et al. (2024) Ragi (finger millet) an ancient with modern application reviewing its potential in addressing contemporary health challenges (wjpmr, 2024, 10(4), 48-51).

6. References Agarwal, S.S. and Singh, V.K. (1999). Immunomodulators: A review of studies on Indian medicinal plants and synthetic peptides. Part I: Medicinal plants. Proc. Indian Natl. Sci. Acad., 65:179-204.

7. Alfons B. Patrick (2001). Modes of action of Freund's adjuvants in experimental models of autoimmune diseases. J. Leukoc. Biol., 70: 849-860.

8. Mahudeswaran K, Ayyamperumal A. A note on the vitamin content of ragi. Madras Agric J, 1970; 57: 289-90.

9. Saleh AS, Zhang Q, Chen J, Shen Q. Millet grains: Nutritional quality, processing and potential health benefits. Compr Rev Food Sci Food Saf, 2013; 12: 281-95.

10. Islam Z, Islam SM, Hossen F, Mahtab-ul Islam K, Hasan MR, Karim R. Moringa oleifera is a prominent source of nutrients with potential health benefits. International Journal of Food Science. 2021 Aug 10;2021.