



Formulation and Shelf Life Study of Ragi Based Frozen Modaks (Sweet Dumplings)

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Abstract:

A study was undertaken to standardise an innovative product- ragi based frozen modaks and to see its consumer acceptability. The shelf life of the modaks was for about a month, without any deterioration the product retained the same taste and shape. The modaks were supposed to be stored at -18°C or below in the freezer. The modaks were made with ragi and dates which was a healthier alternative compared to other sweets and desserts also diabetic friendly, gut friendly and gluten free. Sensory evaluation was done on sensory attributes like texture, aroma, taste, appearance and overall acceptability. The aspects related to packaging, labelling, budgeting, and nutritional labels were studied. The product is worth every penny.

Keywords: modaks, frozen modaks, ragi modaks, ragi satva, ragi malt, dates, shelf life study, diabetic friendly, gut friendly, gluten free, marketing, budgeting, sensory evaluation, sweet dumplings, frozen sweet dumplings.

Introduction:

Modaks are Indian sweet dumplings, one of the traditional sweet delights of Maharashtrian cuisine. Modak are festive rice-flour dumplings popular in Maharashtra that are filled with a sweet coconut-jaggery filling. During the Ganesh Chaturthi Festival, they are offered to the Hindu god Ganesha. Traditionally, filled with sweetened coconut, these sweet dumplings are handcrafted, then steamed. These are known as "Ukadiche Modak" in Marathi, which translates to "Steamed modak." These Millet based Frozen Modaks are made up of Nachani Satva i.e. Ragi Malt and Rice flour. Nachni Satva is a flour which goes through a process known as milling.

While the sweet stuffing is traditionally made of coconut and jaggery including some dry fruits such as almond, cashews, nutmeg and cardamom etc. It was twisted with the addition of Dates (Khajoor) as it becomes a healthier option and also benefits diabetic patients. Dates are also rich in magnesium & potassium which helps maintain blood pressure and are high in antioxidants that promote brain health.

Frozen products are in demand as the modern generation is busy in their day-to-day life and neither have interest in cooking nor have time to cook traditional recipes. And thus packaged foods, precooked foods, frozen products have been accepted, along with it people are also consuming a lot of preservatives and additives, but this product has zero preservatives, naturally gluten free, best for digestion and diabetic friendly.

Objectives :

1. To standardise healthy, innovative and nutritious products.
2. To design nutrition labels.
3. To study the shelf life of the product using a sensory evaluation.
4. To understand aspects of budgeting.
5. To select economical packaging materials.

Methodology :

In the beginning millet based cookies, ladoos, momos were brainstormed and later millet based frozen modaks were finalised. These unique modaks are not commonly seen in the market neither frozen nor millet based. Modak are festive rice-flour dumplings with a sweet coconut-jaggery filling that are popular in Maharashtra. Nachani Satva (Ragi Malt and Rice Flour) is used to make these Millet-based Frozen Modaks. The sweet filling is generally composed of coconut and jaggery, as well as certain dry fruits like almonds, cashews, nutmeg, and cardamom, among other things. It was altered by the addition of Dates (Khajoor) to make it more nutritious.

Ragi - Finger millet (*Eleusine coracana*) is a staple meal in many parts of the world as it is an excellent source of nutrients such as calcium, iron, fibre, and protein, making it an ideal food for people with diabetes, bone health, weight loss, digestion, heart health, and is naturally gluten-free. In addition to being abundant in nutrients, finger millet contains a variety of bioactive substances, such as polyphenol, flavonoid, phytic acid, and dietary fibre (15-20%). Polyphenols have anti-oxidant and anti-diabetic properties. Phytic acid, once thought to be anti-nutritive, is now considered a nutraceutical since it inhibits carbohydrate digestion and hence controls postprandial glucose levels and obesity. As a result, finger millet is an appealing diet for diabetics. The prebiotic content of finger millet was also used by the gut microbiota to produce colonic short-chain fatty acids (SCFAs) and probiotic Bifidobacterium and Lactobacillus, both of which are anti-diabetic in nature.[7]

Dates (*Phoenix dactylifera*) are a member of the palm family *Arecaceae*, also known as *Palmae*. Some biological activity associated with both constituents, dietary fibre and bioactive compounds, such as antioxidant, antibacterial, anti-inflammatory, antitoxic, and antimutagenic capabilities, have been related to the health benefits associated with their consumption. All of these features contribute to the prevention and control of some of the most serious diseases in developed countries, including cancer, diabetes, gastrointestinal diseases, cardiovascular disease, and neurological diseases. Dates are beneficial in terms of glycemia for persons with diabetes mellitus. Dates are high in phytochemicals, including sugar, vitamins, and minerals, and are a good dietary source for both healthy people and diabetics, particularly those using metformin (a rare cause of vitamin B12 deficiency). Furthermore, due to their rich mineral content, particularly magnesium, dates fruits may lower plasma sugar and diabetic retinopathy.[2,5]

Jaggery is a natural sweetener extracted from the juices of sugarcane and/or palm palms. Due to its sweet winy scent and delightful flavour that lies between brown sugar and molasses, jaggery can be used as a base for a variety of sweet foods in many countries. It contains protein, vitamins, and minerals such as iron and copper. It is also utilised as an energy meal with therapeutic benefits, such as blood purification, regular liver function, and blood health. Jaggery aids digestion, cleanses the liver, reduces constipation, boosts energy, purifies the blood, has anti-toxic and anti-carcinogenic effects, relieves tension, is used to treat bronchial or lung infections, and is used to treat premenstrual syndrome.[3]

Coconut flavour compliments savoury foods. Coconuts include polyphenol, antioxidants, which can help protect your cells from damage and may help prevent chronic disease. Coconut is low in carbohydrates but abundant in antioxidants, nutritious fats, and fibres, which may help with blood sugar regulation. Coconut also acts as an antibacterial, which may inhibit the growth of a variety of microorganisms. Coconut meat(Khobra) is high in fat and contains MCTs, which are metabolised differently than other fats. The flesh also contains carbohydrates and protein, as well as a variety of vital minerals such as manganese, copper, iron, and selenium.[6]

Without dry fruits and ghee, no Indian sweet is complete. These modaks had almonds, cashew nuts and pistachios etc. The high fibre content keeps the digestive tract healthy, while the antioxidants and omega-3 fatty acids in the nuts aid to prevent inflammation and have been proved to improve brain capacity and protect against cognitive decline. They include vitamins A and C, which promote healthy skin and hair.[1]

Indian sweets are well-known all over the world. Nobody ignores the exquisite sweets cooked with desi ghee. Ghee is sweet, fragrant, delicious, and healthful; it is produced by separating milk from fat, which makes it lactose-free. Because of the tempting flavours, even diabetic people will occasionally eat a nibble or two. It's high in vitamin A and omega-3 fatty acids, both of which are beneficial to immunity and heart health. The smokey, rich aroma of ghee is the distinguishing feature of a plethora of luxurious Indian sweets. These ghee treats are consumed as a dessert or anytime your stomach demands it. Thus, these modaks have numerous health benefits, making them a great addition to your diet. The taste, fragrance of the steamed modaks, and the shelf life amazed people.

Below are the trials, recipe, procedures, marketing, sensory evaluation and shelf life study of the millet based frozen modaks:

1. Recipe :

The basic major ingredients required to make ragi based millet modaks are ragi, rice flour, coconut, dates, jaggery, water and it can be twisted by adding multiple flavours such as kesar, gulkand, cardamom, nutmeg, chocolate and pan etc. Use of hot water along with milk and ghee gives perfect binding while kneading and moulding the dough into modaks. The taste of the modaks were amazing, hence there was no need for a second trial. The shape wasn't satisfactory thus there was a need to develop practice on the shape and moulding of the modak.

Sr no.	Ingredients	Amount (gms)
1	Ragi malt	500
2	Rice flour	500
3	Water (Hot)	850 ml
4	Jaggery	160
5	Coconut	300
6	Dates	240
7	Almonds	15

8	Cashew nut	15
9	Pistachio	15
10	Milk	50 ml
11	Ghee	26
12	Salt	1 tbsp

Table: 1

2. Procedure :



Procedure of Non-Steamed Ragi Modaks



7

Finely chopped dry fruits were mixed with the stuffing



8

The dough was made with dough kneader machine



9

Small dough were flattened



10

1 tbsp of sweet stuffing was added in the center



11

Modak shape was obtained by tapering the edges



12

Non-Steamed Modaks were stored in an airtight box in the freezer

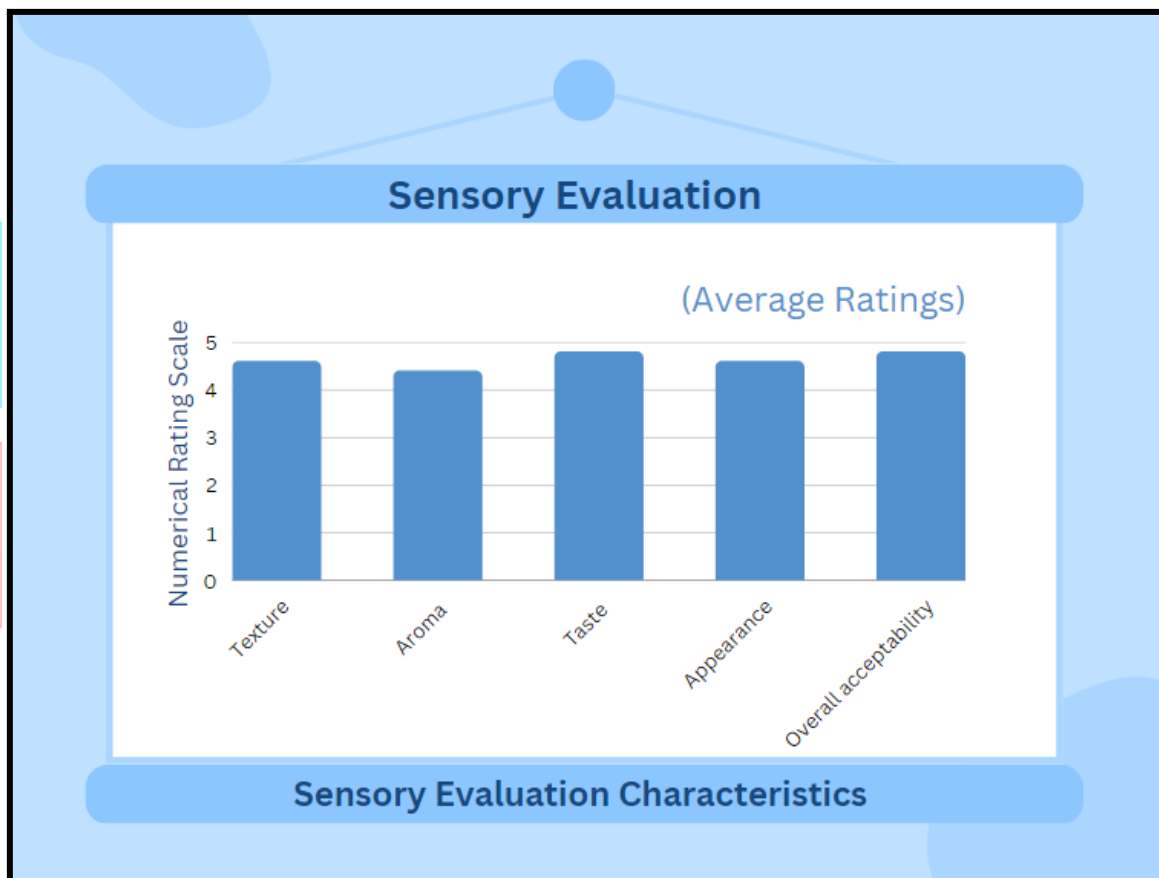
- How to cook :

1. Thaw the frozen modaks for 4-5 minutes.
2. Steam the modaks for 30-40 minutes on a stove gas or in a microwave.

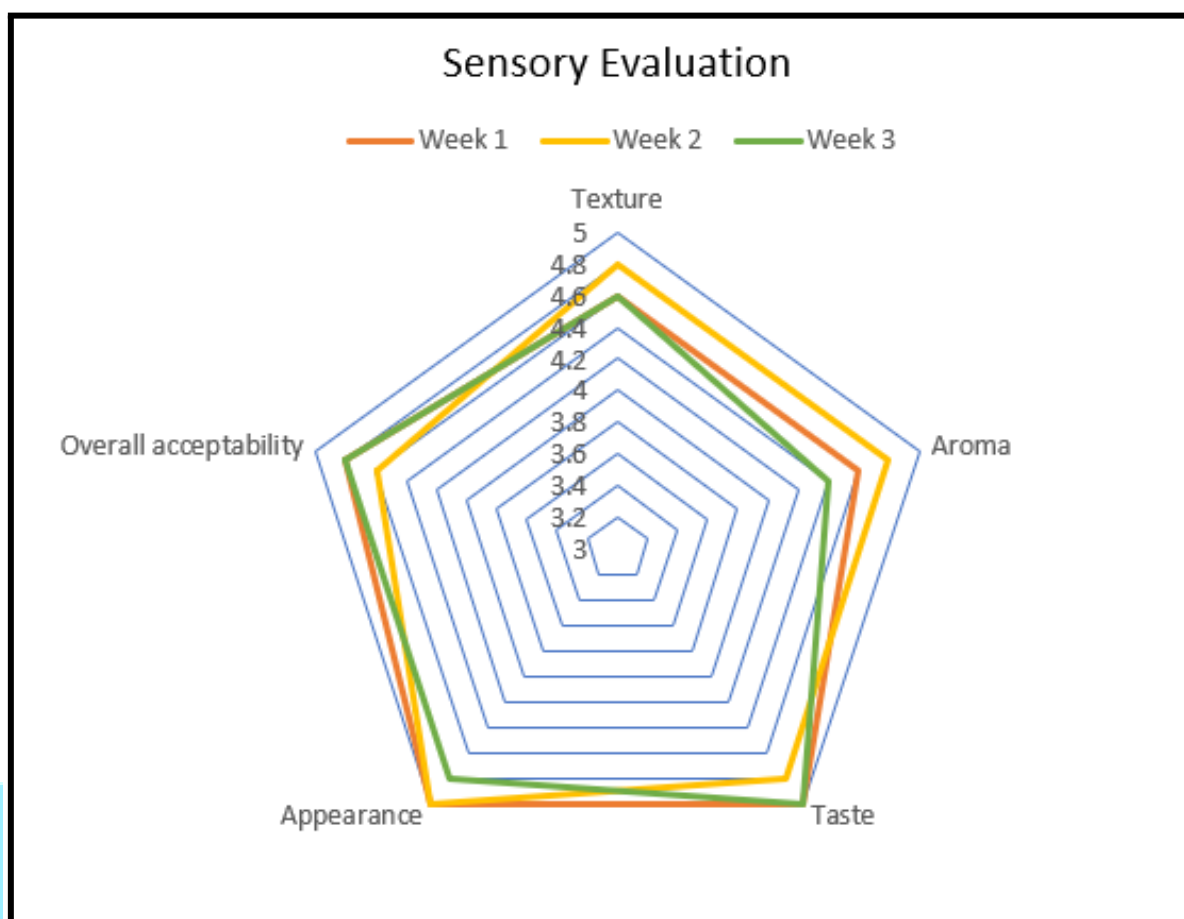
3. Sensory Evaluation & Shelf Life Study :

Sensory evaluation is a science that measures, analyses, and interprets the reactions of people to products as perceived by the senses. It is a means of determining whether product differences are perceived, the basis for the differences, and whether one product is liked more than another. It is an essential tool for quality control, product development, market research, compliance, and brand loyalty. It helps to identify defects or sensory attributes that may affect the product's quality and overall consumer satisfaction.

To study the shelf life of ragi based frozen modaks sensory evaluation was performed 3 times in a month, they were steamed for 45 mins and served. Six members were asked to do the sensory evaluation. The scoring test was done which included texture, smell, taste, appearance and overall acceptability.



Graph : 1



Graph: 2

After four weeks of sensory evaluation no major changes were observed in the characteristics of the product. According to the taste buds there are some ups and downs observed.

Graph represents a shelf life study that shows that the product stays perfect for a longer period of time.

4. Packaging :

For packaging of the modaks plastic glass shaped containers along with the lids were used so that the handcrafted shape of the modaks are prevented and not devastated. Plastic is a popular choice for packaging frozen food products due to its barrier properties, durability, versatility, cost-effectiveness, and convenience. It is easy to handle and store, and can be opened and resealed as needed, making it a convenient choice for consumers who want to store their frozen food products in the freezer.[4] Vinyl stickers were printed according to the size of the glasses.

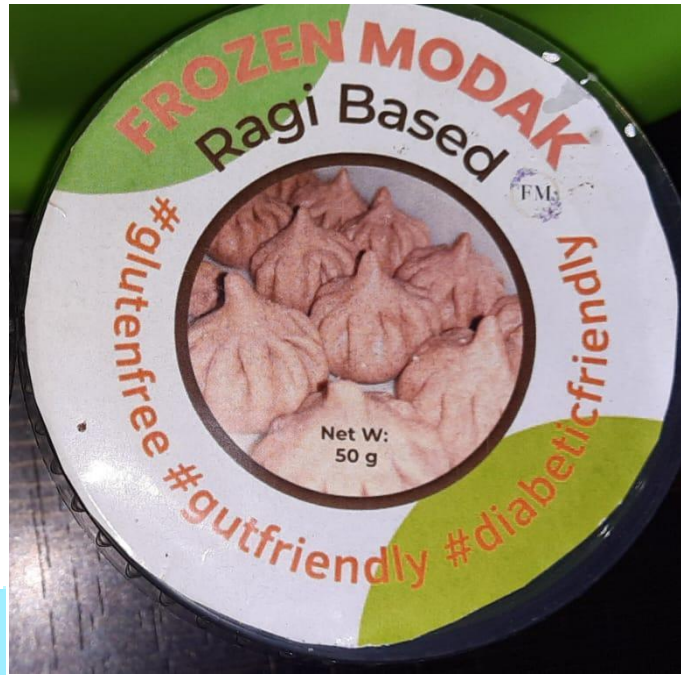


Figure: 16
Top view of the packed product

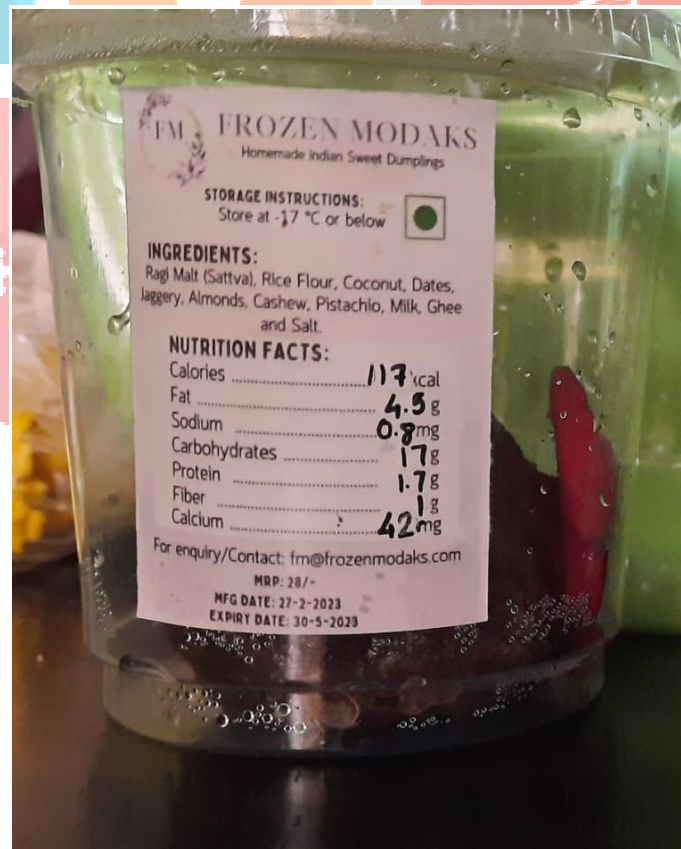


Figure: 17
Front view of the packed product

5. Marketing :

Marketing is important since it helps with the sale of goods and services. Making money is the ultimate goal of any organisation, and marketing is a critical tool for accomplishing that goal. Today, the expense of playing the marketing game is cheaper than it was previously all because of social networking. The modaks were marketed as a nutritious treat for people of all ages. The product image and nutritional information were shared on social media platforms such as Instagram, Facebook, WhatsApp, and Pinterest. The populace's reaction and remarks were recorded. Because of its healthy content, the product sparked many people's curiosity. The positive feedback suggested that this product could be the right place to start for a business.

6. Budgeting :

Budgeting is an essential part of financial management for businesses, providing a roadmap for planning, control, decision-making, resource allocation, and performance evaluation. It helps businesses to manage their financial resources effectively, plan for the future, and make informed decisions while staying within financial constraints.

Sr no.	Ingredients	Amount (gms)	Prices (Rupees)
1	Ragi malt	500	110
2	Rice flour	500	20
3	Jaggery	160	10
4	Coconut	300	40
5	Dates	240	50
6	Almonds	15	15
7	Cashew	15	15
8	Pistachio	15	15
9	Milk	50 ml	15
10	Ghee	45	26
11	Salt	1 tbsp	2
	TOTAL :		318

Table: 2

Large size 35 modaks were obtained from the above quantities, which were then displayed in the college premises and teachers, non-teaching staff and students had bought the modaks and were scrumptious with the taste.

Sr no.	Expenditure	Prices (Rupees)
1	Raw ingredients	318
2	Packaging material	50
3	Labels	90
4	Miscellaneous	300
	Total :	758

Table: 3

These values are for about 35 modaks, so the total amount was divided by 35 and price for 1 modak was obtained.

758 divided by 35 is 21 + 7 rupees profit behind every modak is 28. **Thus , the MRP of the product was 28.**

Nutritional label :

Nutritional labels are significant because they provide important information about the nutritional value of the foods we consume. They help us make informed judgments about what we eat and maintain a healthy and balanced diet.

The 35 modaks so the total quantity was divided by 35, to obtain the nutritional label for 1 modak (sweet dumpling) as the labelling and packaging was designed for 1 modak.

Here are some of the reasons why nutritional labels are essential:

Nutritional labels contain information about a food item's serving size, which helps us comprehend how much food we are consuming. Nutritional labels give information on a food's nutrient content, such as the number of calories, protein, fat, carbs, vitamins, and minerals. This allows us to make more informed meal choices and select items that are high in nutrients and low in calories. Nutritional labels are especially important for those who have diabetes, high blood pressure, or heart disease who need to regulate their intake of certain nutrients like sugar, sodium, or saturated fat. Nutritional labels enable us to compare different goods and select healthier and more nutritious options. For example, we can evaluate the nutrient content of various cereal brands to determine which one is higher in fibre and lower in sugar.

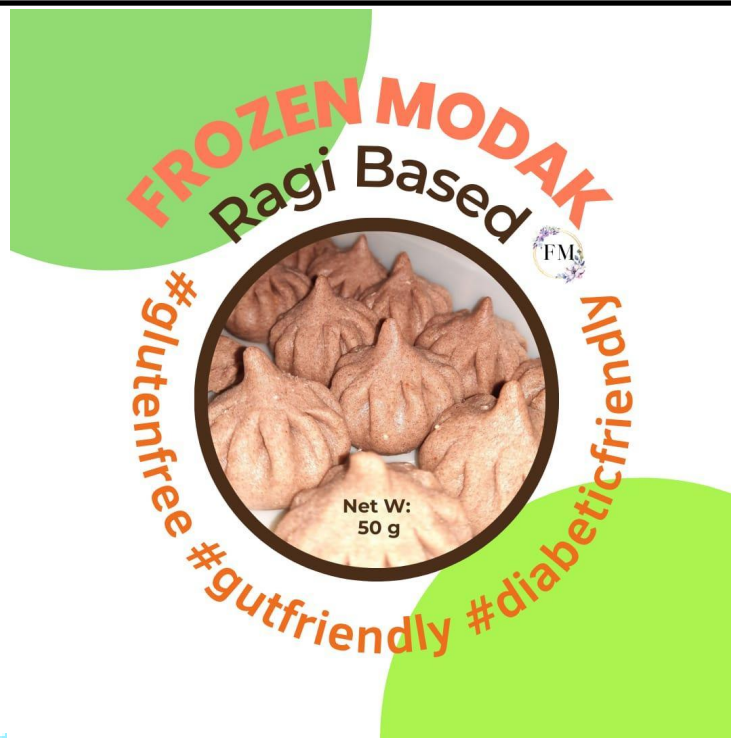


Figure: 18
Top label of the packaging

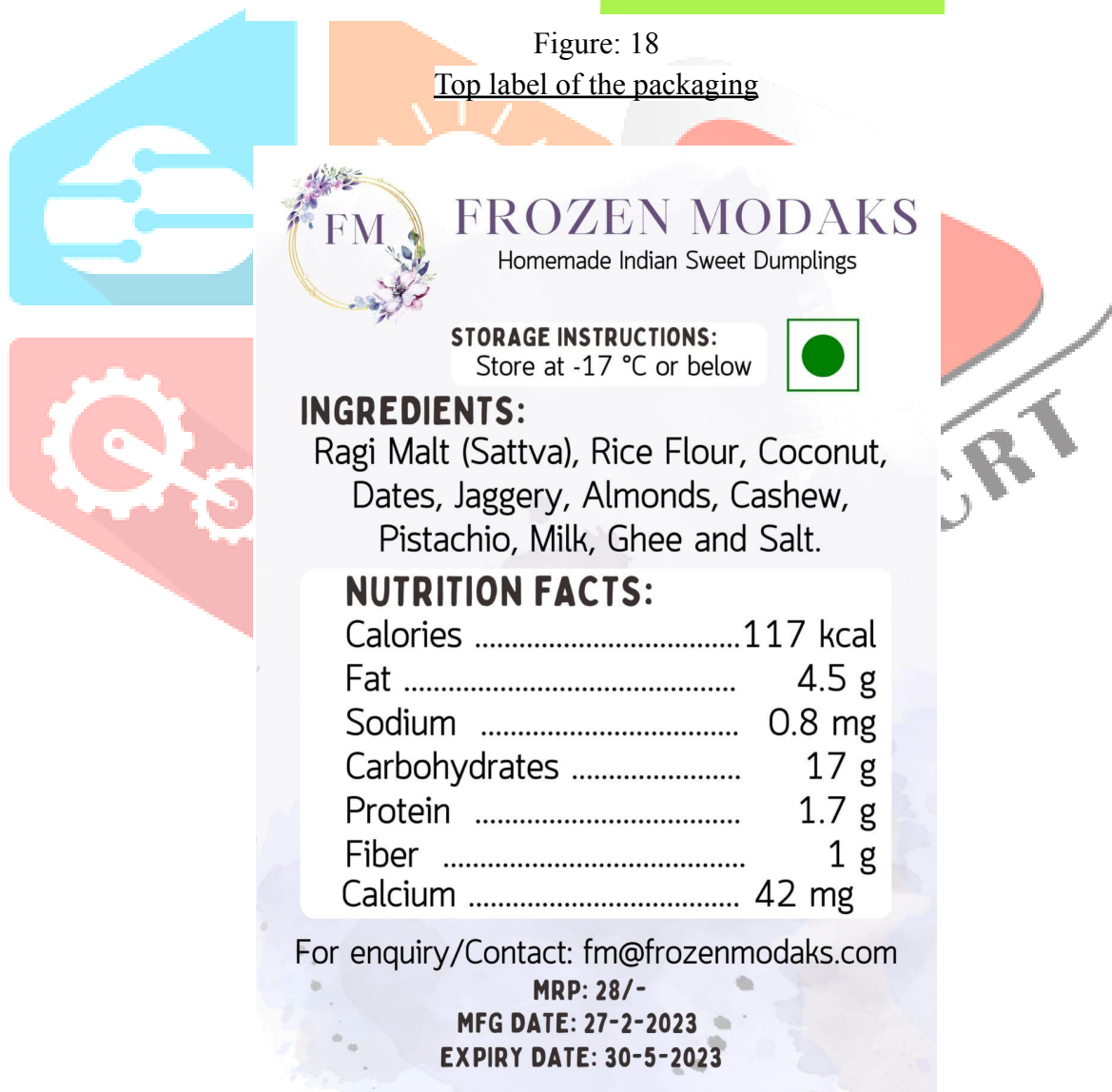


Figure: 19
Nutritional label of the product on the vertical side of the glass

Nutrients were calculated using the ICMR- National Institute of Nutrition website through the Count What You Eat platform. The labels were made by using canva app.

Summary :

Ragi based Frozen Modaks is a healthier alternative compared to other desserts, also easy to cook (no need of thawing, steam directly), filled with healthy calories and fat and calcium. Frozen modaks have been an interesting product to all the sweet tooth consumers. Since the product is frozen there is no microbial growth or any other damage taking place. It's been reported by many vloggers and catering business people that the shelf-life of the Frozen Modaks is more than 3 months. Thus, scientifically more shelf-life studies are required for the frozen products in the industry. The product can be deteriorated if not maintained at required temperature i.e. -18°C or below. These ragi based frozen modaks are gluten free, diabetic friendly, and gut friendly, high in nutrients and a need of the generation. It has received a positive response from the consumers.

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