Development of Jelly Cake and its Sensory Evaluation by Using Millet and Amla

Abstract:

One cereal with a short growth season that is resistant to disease, pests, and drought is millet. Future human needs will depend more and more on this agricultural product as the world's population rises and water supplies decrease. Grain-free millet can be used to make gluten-free dishes for those with coeliac disease. To increase the baking capabilities of flour, it can be treated physically and with additions due to the inferior quality of baked goods prepared from gluten-free cereals.

The growing awareness of health and nutrition has resulted in an increased demand for functional foods. Multimillet cakes with amla jelly combine the fibre and nutrient-dense benefits of several millets with the antioxidant characteristics of amla. This one-of-a-kind product promises to offer a nutritious, gluten-free dessert choice that will appeal to health-conscious consumers.

Main Methods: Ingredient Selection: Millets (including ragi, jowar, bajra) were chosen for their nutritional value. Amla was turned into jelly. Recipe Development: Different ratios of millets and amla jelly were explored to increase texture, flavour, and nutritional value. Baking Procedure: The cakes were cooked according to normal procedures, with temperature and duration adjusted to guarantee optimal cooking and moisture preservation. Nutritional Analysis: Proximate analysis was used to determine the nutritional value, with particular emphasis on protein, fibre, fat, carbohydrates, ash and moisture content. Sensory Evaluation: A panel of tasters assessed the cakes' flavour, texture, and overall acceptability.

Health professionals and customers are placing more and more pressure on food firms to produce healthier food products. Gluten-free flours (such as millet, soy, flax, etc.) are becoming more and more in demand, which presents food firms with new sales opportunities. In light of this, a study was conducted to create millet-based sponge cakes with amla jelly with the goal of enhancing the product's nutritional and sensory qualities. Apart from a reference sample that contained solely refined flour, an alternative cake was made by adjusting the proportions of wheat flour.

Nutritious Value: The multimillet cake contains much more nutritious fibre and protein than conventional cakes, and the addition of amla jelly provides a high concentration of vitamin C and antioxidants.
Sensory Acceptance: The majority of panelists rated the cakes positively, noting the amla jelly's unusual flavour and moist texture.
Stability: The jelly's capacity to hold moisture allowed the cakes to stay fresh for several days.
Conclusion: Millet cake with amla jelly successfully combines health benefits and palatability, offering a healthy option in the dessert market. This product not only meets customers' desire for healthier eating options, but it also promotes the use of traditional ingredients in modern cuisine. Future studies may focus on enhancing shelf life and optimising flavour profiles.

Keywords: Amla jelly, Millet based cake, Gluten free dishes, Healthier foods, Sensory evaluation, Nutritional products, Healthier dessert , Nutritional analysis

Introduction:

Celiac disease (CD) is an immune-mediated, systemic disease [1]. In many countries, the number of newly diagnosed cases of CD has increased indexically over the past 30–40 years, and its etiology remains unclear (Catassi, C et, al 2022). The gluten-free diet remains the sole essential therapy for celiac disease, thus fueling a surge in demand for gluten-free products (Das, A.B et, al 2019). However, due to its purified starch-based composition, an unbalanced gluten-free diet is also linked to nutritional deficiencies, such as protein and dietary fiber insufficiency, as well as a high GI (PuniaBangaret,al 2022). Therefore, the formulation of gluten-free foods requires the prudent selection of raw materials (Xiao et,al 2023)

The millet grain contains about 65% carbohydrate, a high proportion of which is in the form of non-starchy polysaccharides and dietary fibre which help in prevention of constipation, lowering of blood cholesterol and slow release of glucose to the blood stream during digestion. Lower incidence of cardiovascular diseases, duodenal ulcer and hyperglycemia (diabetes) are reported among regular millet consumers. Millet grains are also rich in important vitamins viz., Thiamine, riboflavin, folic acid and niacin. Millets are comparable to rice and wheat or rich in some of the minerals as well as fatty acids. Millets vary largely in

composition of carbohydrates as proportion of amylose and amylopectin content vary from 16-28% and 72-84%, respectively

Superior food products have grown more and more in demand from consumers and healthcare professionals in recent years. Food businesses, however, have addressed this task with comparably little success since people generally believe that choosing healthy food puts fun eating in direct contradiction. As a gluten-free diet, millet has been shown to be beneficial for those who have celiac disease, which is most brought on by consuming cereal proteins. Across the world, millet is a very variable tiny seed grass that is cultivated for food grains or cereals. It grows well in areas with hot temperatures and little rainfall, especially on dry, poorly fertilised soils. Its growing season is brief, yet it can yield good amounts of grain in poor conditions for most other cereals. Millet, like other cereals, has 75% complex carbohydrate and 10% fat and fibre (roughage). It has been suggested that the high nutritious value of millet could improve family food security in Africa. Millet is very important for health and the economy. As an example, millet is considered a heart-healthy dietary option due to its high magnesium content (19% of the daily recommended amount) (Kwaw, 2013). In Indian pharmacopoeia, amla is utilised as a potent rejuvenator and is one of the highest sources of vitamin C (ascorbic acid 500–1,500 mg/100 g), pectin (2.25%–11.19%), and polyphenols (24.61%–31.12%). Amla is cultivated commercially all over India due to its excellent adaptability and favourable financial returns. The crop is ideal for marginal terrain, hardy, and low maintenance. This fruit is also widely available for a good portion of the year at fair market pricing. Amla has an astringent and sour flavour, which makes it less popular as a fresh fruit. Nonetheless, the fruit's nutritional and therapeutic qualities present a significant opportunity for value addition to goods such as sweets, pickles, preserves, juice, dried powder, and ready-to-serve beverages (Tuorila and Cardello, 2002).

Whole grains like millets are rich in minerals, fibre, protein, and antioxidants, and they may offer a number of health advantages:

- Blood sugar regulation

Millets are a great option for those with type 2 diabetes since they have a low glycemic index and include carbohydrates that help manage blood sugar.

- Loss of weight:

Because millets are high in fibre and low in calories, they may aid in weight loss.

- Cardiovascular well-being

Magnesium and vitamin B3, which are found in millets, can help control cardiac rhythm and lower triglycerides and cholesterol.

- Sentiment

Tryptophan, an amino acid found in millets, has the potential to alleviate symptoms of anxiety and depression.

- Protection from diseases

Barnyard millet helps maintain a healthy body temperature and strengthen immunity.

- Preventing asthma

Patients with asthma may have better breathing processes when using pearl millet, or bajra.

Finger millet is considerably rich in micronutrients such as vitamins and minerals in comparison to world's other major cereals, wheat and rice. Especially, finger millet is the richest source of calcium and have 10 times more than wheat, maize and rice and three times greater than milk.. The data gives the value of macronutrient content of finger millet, it contains 72.6% carbohydrates, 1.3% fat, 7.3% protein, 19.1% dietary fiber, 3.6% crude fiber and 3% minerals. (Jagati, P et al 2021)

Sorghum has 11.9 per cent of moisture and about 10.4 per cent of protein and a lower fat content of 1.9 per cent. The fibre and mineral content of grain sorghum is essentially similar, and is 1.6 per cent. It is a good source of energy and provides about 349 K cal and gives 72.6 per cent of carbohydrates (Gopalan et al., 2021). Starch is the major carbohydrate of the grain. The other carbohydrates present are simple sugars, cellulose and hemicellulose. The amylose content of starch varies from 21.28 per cent. Sorghum is also rich in dietary fibre (14.3%). Calcium, phosphorous and iron content of sorghum is 25 mg, 222 mg and 4.1 mg (per 100 g of edible portion), respectively (Hosmani and Chittapur, 2017)

. In different pearl millet genotypes the starch content of the grain varied about 62.8 to 70.5%, soluble sugar 1.2 to 2.6% and amylose 21.9 to 28.8% (Jambunathan and Subramanian, 2018). Lower values for starch (56.3 to 63.7%) and amylose (18.3 to 24.6%) have been found in some high-yielding Indian pearl millet varieties (Singh and Popli,2019). Jambunathan and Subramanian found that the predominant component of total soluble sugar (2.16 to 2.78%) was sucrose (66%), followed by raffinose (28%)

The micronutrients which are present in Jaggery have many nutritional and medicinal aspects such as its anticarcinogenic and antitoxic activity. Jaggery has proved itself better when compared with white sugar. Jaggery is known to produce heat and give instant energy to a human body.Sugar and sweet consumption have been popular throughout the world,

increasing trend of per capita sugar consumption assumes significance in view of the high tendency for individuals to develop insulin resistance, abdominal adiposity, and hepatic steatosis, and the increasing chronic disease such as type 2 diabetes and cardiovascular diseases.(Kumar, A., & Singh, S. (2020)

Some of the benefits of Amla:

- Anti-inflammatory substances

aid in the prevention of infections and reduce inflammation.

- Enhances skin (Saleh et al., 2013)

Amla extract can be ingested or applied topically to improve skin tone and texture, combat hyperpigmentation, and slow down the aging process.

- Low glycaemic index of 15

which helps shield the body from high blood sugar processes, is beneficial for diabetes.

- High fiber and protein

The content of this weight reduction solution can help eliminate waste from the body and manage cravings.

- Hair care

Which slows down graying, stops breakage, and strengthens hair shafts.

increases immunity

- Vitamin C content

fights viral infections and functions as an antioxidant.

- Reduces hypertension

elevated amounts of vitamin C lower cholesterol and lessen hypertension symptoms (Gul et al., 2022).

Methodology:

This discusses the materials and techniques used in research. It includes all the information on how research work would be carried out in the context of a specific framework. The following objectives are addressed in the methodology chapter:

Objectives of the research :

- To develop cake by using millet flours (bajra , ragi and jowar) , refined flour and amla and characterize it .
- Nutritional profiling of developed jelly and cakes.
- To evaluate the cakes based on their sensory characteristics

Sample: The materials required are ragigrains , bajra grains , jowar grains, refined flour , amla , jaggery powder, milk , curd, vanilla essence , baking soda , baking powder, butter, sugar , lemon

A. Development of cake by using millet flour and amla jelly and its characterization:

1. Making of millet flour:

After sorting and washing the millet seeds to get rid of any unwanted particles, they were left to soak for a full day. After soaking the seeds, the flour was sun-dried for a whole day.

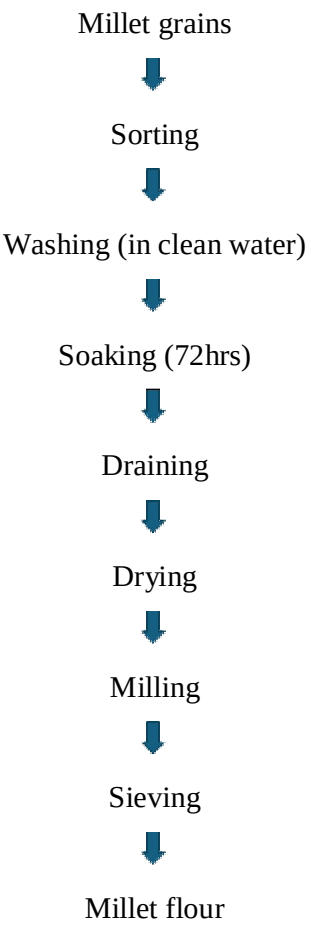


Figure 1: Flow chart for millet flour production

2. Making the millet based cake

The cake recipe is described by the used millet flour, and the ratio of flours used is shown.

Table 1: Ratio of ingredients for cake preparation

SNo.	Ingredients :	Amount :
1	Ragi flour	25g
2	Bajra flour	25g
3	Jowar flour	25g
4	Jaggery powder	50g
5	Baking powder	1 tsp
6	Baking soda	½ tsp
7	Butter	2 tbsp
8	Vanilla essence	2-3 drops
9	Milk	50ml
10	Curd	40g

3. Method of preparation:

1. In order to make a cake, we needed to preheat the oven for 20 minutes at 180 degrees Celsius.
2. Firstly, we had to measure all the flours according to Table 1 (mentioned above) and mix them in a bowl thoroughly.
3. In the dry mix bowl, we added baking soda and powder and kept this dry mix aside .
4. The dry mix was sieved 2-3 times so that it had enough air settled between the granules of the dry mix.
5. In a separate bowl, we mixed all the wet ingredients, like jaggery, vanilla essence , melted butter, milk, curd , and water.
6. In the bowl of the wet mixture, we slowly and gradually added the dry mixture.
7. We used the cut and fold method to prepare the batter of the cake.
8. We greased the tin with butter and then applied butter paper to it.

9. Slowly, we poured all the batter into the tin and kept it in the oven for 35 to 40 minutes at 180 degrees Celsius.

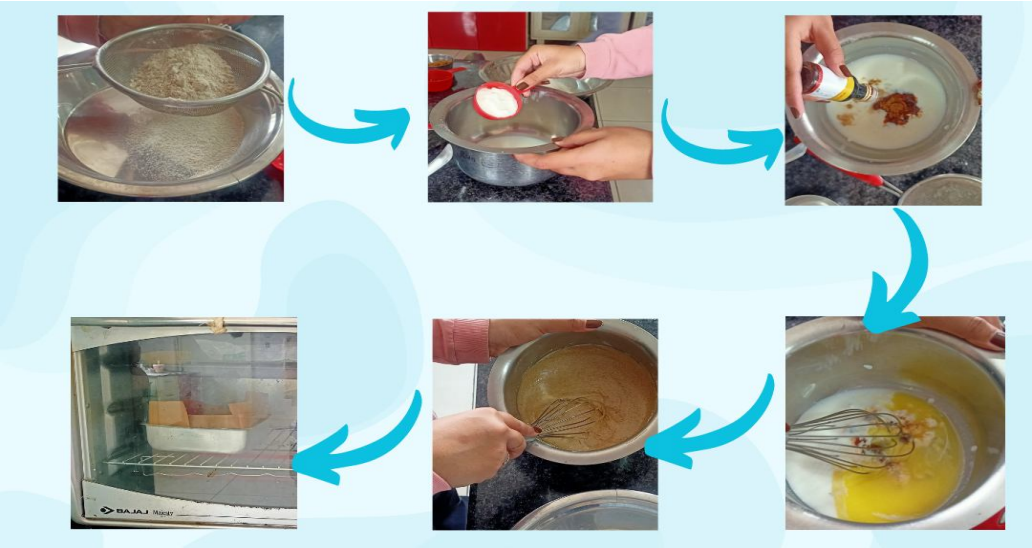


Figure 2: Preparation of millet cake

4. Making the refined flour based cake

Another cake was made by using refined flour as a standard cake, and the method of preparation was the same as the above millet based cake .

Table 2. Ingredients for standard cake

SNo.	Ingredients :	Amount :
1.	Refined flour	25g
2.	Jaggery powder	50g
3.	Baking powder	1 tsp
4.	Baking soda	½ tsp
5.	Butter	2 tbsp
6.	Vanilla essence	2-3 drops

7.	Milk	50ml
8.	Curd	40g

Fig. 3: Maida/refined flour cake

5. Amla Jelly Preparation:

- Gather Ingredients: Wash fruit thoroughly and remove stems, pits, and any spoiled parts. Chop or crush fruit as needed.
- Cook: Place amla in a large pot or saucepan and add a small amount of water to prevent sticking. Simmer fruit until soft and pulpy.
- Extract Juice: Strain cooked fruit through a muslin cloth or jelly bag to extract juice. Allow juice to drip freely without squeezing.
- Boil Mixture: Bring the mixture to a rolling boil over high heat, stirring constantly.
- Test for Gel Point: Perform a gel test to determine if the jelly has reached the desired consistency. Optionally, use a candy thermometer to monitor temperature (usually around 220°F or 104°C).
- Fill Jars: Store in a cool, dark place (Kaviya, 2023).

Table 3 : Ingredients used tomakeamla jelly

SNo.	Ingredients :	Amount :
1.	Amla	500g

2.	Lemon	15g
3.	Sugar	30g

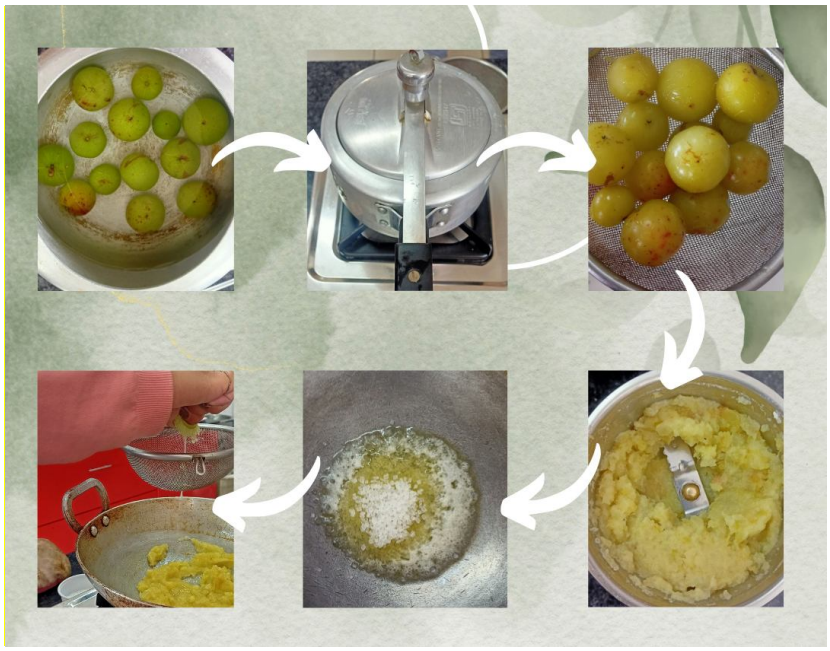


Fig 4 :Amla jelly preparation

6. Final Product:

Fig. 5: Millet cake with Amla jelly

B. Nutritional profiling of developed jelly and cakes.

Analysis of samples was carried out according to the standard analytical methods outlined by the AOAC protocols. This included determining the proximate composition, moisture, fat, ash, and protein levels. In accordance with the AOAC procedures 925.40, the samples were dried in an oven at 105 ± 2 °C until they reached a constant weight in order to measure the moisture content. In accordance with the AOAC protocols 942.05, the sample was incinerated for 20 hours at 550°C to determine the ash concentration. Following AOAC protocols 984.13, the micro-Kjeldahl method was used to assess the nitrogen (N) content, and the protein content was determined as N × 6.25. The Soxhlet method, in accordance with the AOAC 963.15 standard, was used to determine the lipid content. Following the methodology described by Onyeike et al. (2015), the total carbohydrate content was calculated using the difference method. We performed triple analyses on all samples.

C. Evaluation of jelly cake based on sensory characteristics

For the sensory analysis, thirty panels that had never been trained were chosen. After tasting each sample, the panelists were given samples of millet based cake and refined flour cake served with amla jelly and water to rinse their mouths. On a 9-point hedonic scale, each panel assessed the samples for visual puffiness, appearance/color, smell/aroma, taste, general texture/mouth feel, moistness, and overall like (1 being strongly disliked, 5 being neither much liked nor disliked, and 9 being highly liked). Following that, their evaluations were entered on a Sensory Analysis Form.

Scorecard - Hedonic Rating Scale

Tray number ..... Name .....

In front of you is a coded sample. Taste the sample and tick ✓ how much you like or dislike it. You can taste the sample more than once.

	Appearance/colour	Taste/Flavour	Smell/Odour	Texture/Mouthfeel
like extremely				
like very much				
like moderately				
like slightly				
neither like nor dislike				
dislike slightly				
dislike moderately				
dislike very much				
dislike extremely				

Fig 6 : Hedonic Rating Scale

Results :

A. Development of the products

There were 2 samples. one cake base made with millets (ragi, jowar and bajra) and the other made by refined flour . All other ingredients of the cakes were same . Later on, the amla jelly was incorporated between the layers of both cakes.

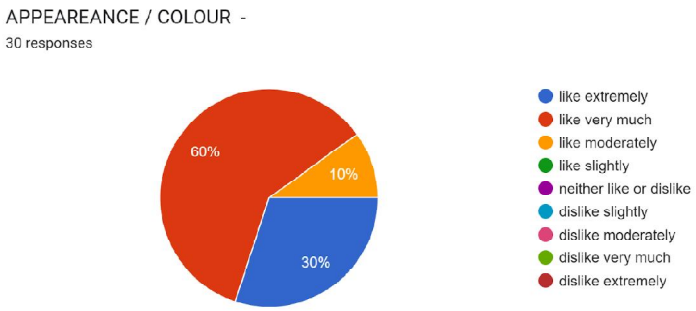
B. Nutritional profiling of the samples

The proximate composition of the cake samples and jelly was analyzed for ash content, moisture, fat, crude fiber, protein, carbohydrate content, and energy value. The results are as follows for 5g of sample :

Table 4 : Nutritional Profiling of the products

SNo	Sample	Moisture	Ash	Fat	Crude fibre	Protein	Carbohydrate
1.	Millet cake	4.4%	28.5%	2%	6.8%	1.45%	56.84%
2.	Amla jelly	5.8%	4%	22%	9.2%	0.003%	58.94%
3.	Madia cake	12.5%	0.8%	2.9%	0.45%	11.27%	72.08%

C. Sensory Evaluation of the cakes :



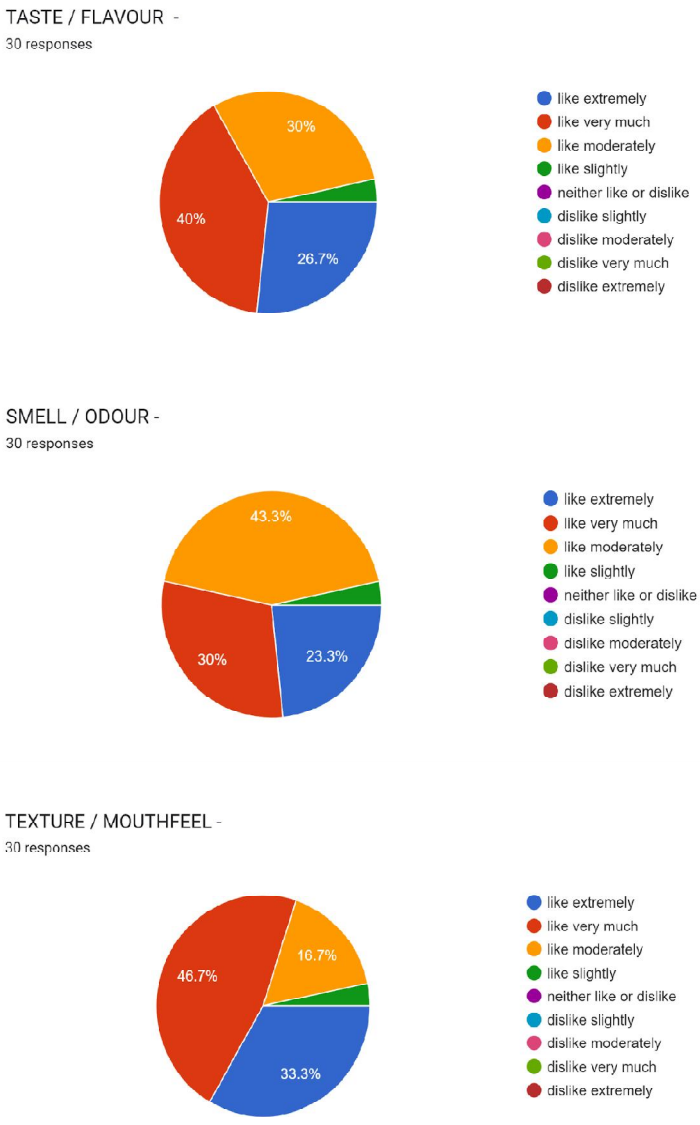


Fig 7. Sensory assessment of the millet-based cake

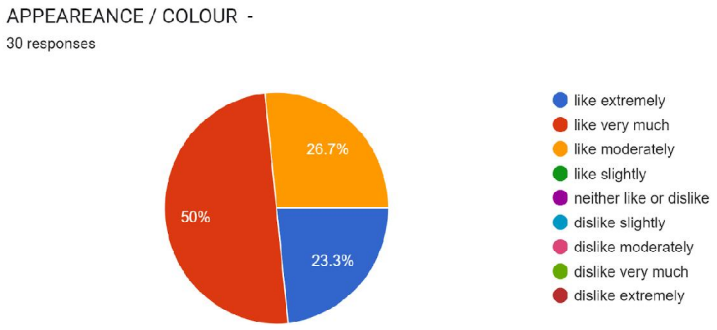
The millet and amla cake is visually pleasing, with a golden-brown crust and millet grain particles for texture and aesthetic appeal. The inclusion of amla may cause a slight hue change, giving it a distinct visual character that sets it apart from normal cakes. Moving on to aroma, the cake has a wonderful scent that combines the nutty flavour of millet with the fruity notes of amla, resulting in a fascinating olfactory experience that piques interest and excitement. The aroma may elicit sensations of warmth, comfort, and reminiscence, enhancing the cake's sensory appeal.

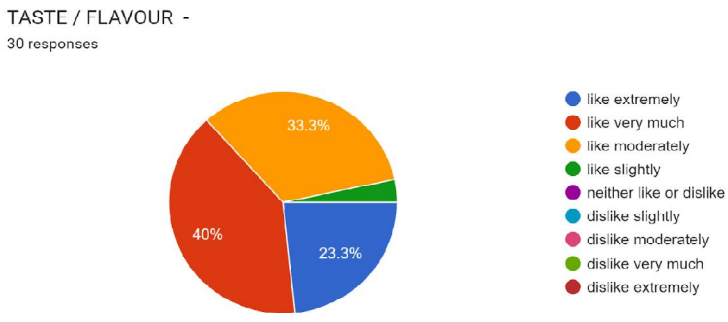
The texture of the millet and amla cake is an ideal balance of softness and crunch, with the delicate crumb offset by the mild crunchiness of millet grains. This texture diversity adds interest and variation to each mouthful, making for a satisfying and sensory-rich eating experience.

The cake's flavour is a perfect blend of sweet and tangy notes, with millet's natural sweetness balanced by amla's acidity. This balanced flavour profile is a welcome departure from traditional cakes, appealing to those looking for new and unusual taste experiences.

Overall, the sensory evaluation of the millet and amla cake reveals a treat that is both visually appealing and delicious. Its visually appealing appearance, enticing aroma, delightful texture, and balanced taste profile all combine to create a sensory experience that captivates the palate and leaves an indelible impression.

The sensory attributes study focusses on the millet and amla cake's potential as a standout dessert option that blends culinary innovation with nutritional benefits. As the role of sensory pleasure in food consumption develops, the millet and amla cake is a shining illustration of how healthy ingredients and new culinary techniques may combine to create a truly amazing dessert offering.





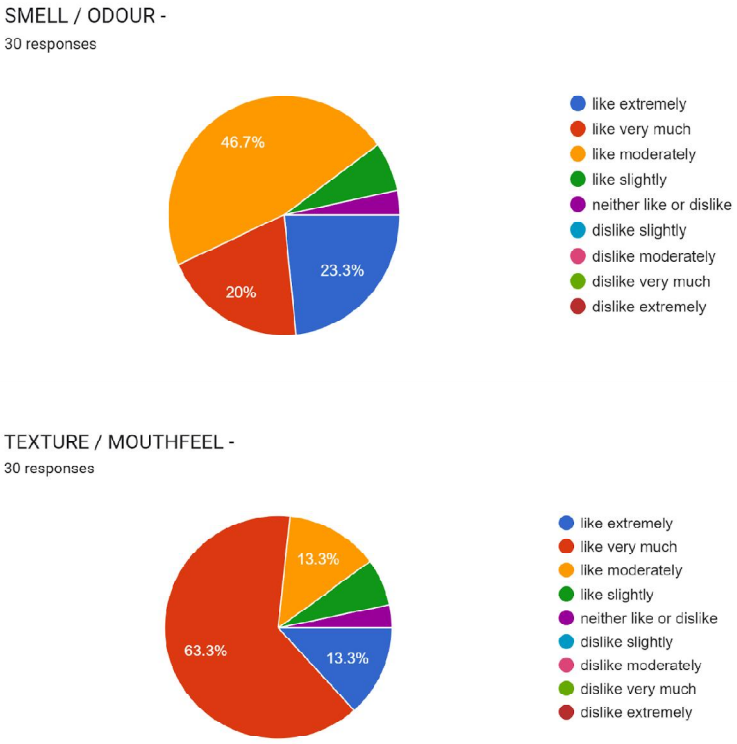


Fig 8 : Sensory assessment of the Maida cake

Discussion:

As the finished result, a multi-millet cake was created, with a base of millets, a flavour of vanilla, and an amla jelly included in the centre.

The products made provides a unique combination of nutrition, flavour, and creativity. This cake gives both enjoyment and health advantages by using millet, a healthy whole grain high in fibre and key minerals, as well as amla, a powerhouse of antioxidants and vitamin C. We discovered a cake that not only tastes good but also nourishes the body through meticulous formulation and proximate analysis.

A fantastic flour for baking without gluten is millet. Its mild flavour and fine texture make it ideal for use in delicate cakes (Obilana, n.d.). It produces an all-in-one blend suitable for making cakes, fast bread without gluten, and other dishes. Millet's soft, starchy nature when processed to a flour makes it perfect for baking without gluten. Because millet can taste a little bitter when consumed raw, it is best blended with other mild flours to bring out the flavour notes of millet, which include buttery, nutty, and grassy. Amla is naturally sour and tangy, but when made into jelly, it's often combined with sugar or other sweeteners to balance

out the tartness. Overall, it's a refreshing and flavourful treat enjoyed by many (Rotela et al., 2021).

Overall, the millet and amla jelly cake emerges as a promising option in the realm of healthy desserts, offering a blend of taste, nutrition, and innovation. Its nutritional profile reflects a careful balance of macronutrients and micronutrients, making it a suitable choice for individuals seeking delicious yet health-conscious treats. As awareness of the importance of balanced nutrition continues to grow, this cake stands as a testament to the potential of incorporating wholesome ingredients into culinary creations, bridging the gap between indulgence and wellness.

In conclusion, the above tests conducted on the cakes confirm its nutritional integrity, sensory appeal, and overall quality. This innovative dessert option represents a harmonious blend of health-conscious ingredients, culinary creativity, and sensory indulgence, making it a standout choice in the realm of modern desserts. As consumer preferences continue to evolve towards healthier and more wholesome food options, the millet and amla cake emerges as a delicious and nutritious treat that embodies the intersection of taste, nutrition, and innovation.

Conclusion:

One healthy and beneficial component for making gluten-free cakes is millet flour. Physically modified flour and starch are becoming more popular because of customer desire for additive-free foods. This is because the modification changes the functionality of starch without adding any extraneous materials. Consequently, flour can be used to raise the calibre of bread foods without gluten.

The nutritional content of the formulation improved following the proximate analysis. The panel accurately differentiated between samples based on sensory qualities on a 9-point hedonic scale. Overall, the panel found both items acceptable.

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