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Development of gluten-free slice cake

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Abstract

Functional food science has gained momentum recently in response to the changing lifestyle and health status of developed countries. Pseudo cereal grains are becoming current trend in human diet as a gluten-free substitute, with excellent nutritional and nutraceutical value. Although, gluten is safe for most of the people, those with Celiac Disease or Gluten Intolerance should strictly avoid it. Since, Indian diet mainly consists of high gluten content, it is necessary to develop a gluten-free product. Buckwheat flour and ginger powder were used to prepare Slice cake. The cake was analyzed for its nutritional, microbial and sensory properties. Shelf-life studies were also carried out and a suitable packaging material was also identified.

Keywords: Functional food, pseudo cereal, celiac disease, gluten intolerance, gluten-free

1. Introduction

Celiac Disease is a type of an autoimmune disorder in which the environmental precipitant Gluten is known. The condition is such where consumption of gluten can cause subsequent damage to the small intestine. Symptoms of Celiac Disease may include chronic diarrhea, bloating, nausea & vomiting, abdominal pain, etc.

According to experts at All India Institute of Medical Sciences, Celiac Disease affects close to 6 to 8 million people in India. It is estimated that, every 1 in 100 people suffer from Celiac Disease ^[1]. The only way to manage condition better is to ensure consumption of gluten-free diet.

Gluten is a naturally found protein in some grains including Wheat, Barley, Rye, etc. It acts like a binder, holding food together and giving it a stretchy quality. Although, it is safe for most of the people, those with Celiac Disease or Gluten Intolerance should strictly avoid it. If an unknowingly sensitive person continues to eat gluten, it creates a kind of battle ground resulting in inflammation. The side effects may range from mild (fatigue, bloating, diarrhea) to severe (unintentional weight loss, malnutrition, intestinal damage) as seen in autoimmune disorder Celiac Disease.

Interestingly studies have shown that, people who do not have Celiac Disease are the biggest purchasers of gluten-free products. Consumer surveys shows that the top three reasons people select gluten-free food are for “No reason”, because they are a “Healthier option” and for good “Digestive health” ^[2]. Weight loss was reported as another common motivator for adopting Gluten-free diet, especially among younger adult population. However, evidence supporting the effectiveness of a Gluten-free diet in weight management is limited ^[7].

Along with consumption of naturally gluten-free foods in their whole form like fruits, legumes, nuts, fish, eggs, etc. the following whole grains are also inherently gluten-free: Millet, Quinoa, Buckwheat, Corn, and Amaranth. Buckwheat Ginger Slice Cake is made from Buckwheat flour and ginger powder.

Buckwheat: Buckwheat belongs to a group of foods commonly known as Pseudo cereals. Pseudo cereals are seeds that are consumed as cereal grains but do not grow on grasses. Despite its name, Buckwheat is not related to Wheat and is gluten-free. Buckwheat has become a health food due to its high mineral and antioxidant content. Its benefits include improved blood glucose levels, boost heart health, improved digestion, helps in weight management and is a good source of protein and fiber.

Dry Ginger powder: Dry ginger powder, commonly known as ‘*Sonth*’ in Hindi, ‘*Suntha*’ in Marathi, ‘*Soonth*’ in Gujarati and ‘*Sontii*’ in Telugu. Dry ginger powder is widely used to add

flavor and aroma. It has various benefits especially in Ayurvedic healing. It has anti-inflammatory properties that help improve digestion. It is a natural medicine used in treatment of common cold. It has anti-bacterial properties too, that helps prevent any infection in body.

Celiac disease is now seen as one of the emerging health epidemics, so creating awareness and educating people about the disease is the need of hour. This is the reason present study was undertaken and a Gluten-free Slice Cake was developed.

2. Materials and Method

2.1. Materials

Buckwheat flour, powdered sugar, dry ginger powder, unsweetened Cocoa powder, Roquette protein, baking powder, baking soda, yogurt, vanilla extract, oil, milk, ginger candies.

2.2. Method of preparation

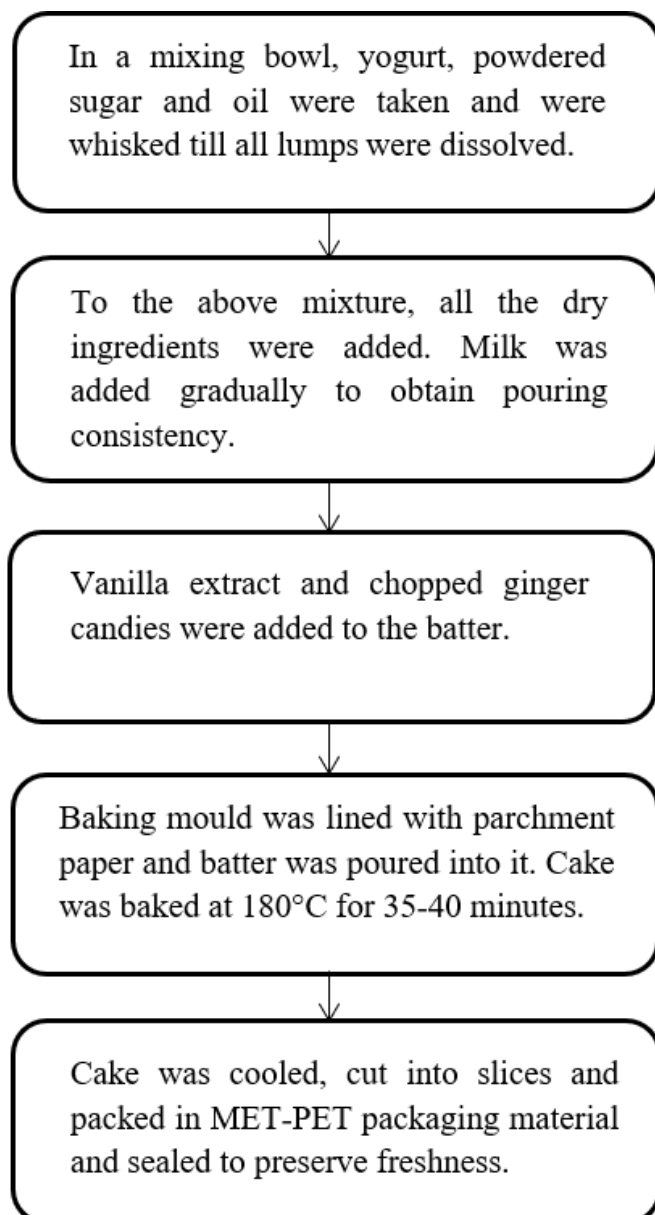


Fig 1: Buckwheat Ginger Slice Cake

2.3. Proximate Analysis

The Proximate Analysis of the slice cake like Moisture, Ash, Energy, Protein content, Fat content, Carbohydrates, was conducted according to AOAC manual.

2.3.1. Estimation of Gluten content

Dry Gluten from wet Gluten was estimated by using Oven Dry method.

2.4. Microbial Analysis

The microbial load of the product was determined using Total plate count method. The samples were prepared using serial dilution method (Ten Fold Dilution). Sample was then spread on Nutrient Agar plate and Sabouraud's Agar plate for the bacterial and fungal/molds count respectively.

2.5. Sensory Evaluation

Various sensory parameters such as Appearance, Odor, Color, Taste, Texture and overall Acceptability of the product were analyzed with the help of 30 untrained panelists.

2.6. Shelf life Studies

Shelf life studies of the product were conducted from the second day of manufacturing of product. Shelf life of the product was examined by keeping it at ambient room temperature and analyzing it every day for its moisture content and fungal/mold growth.

3. Results and Discussion

3.1. Evaluation of Proximate Analysis

Table 1: Results of all the Parameters

Parameters	Quantity per 100g (mean ± SD)
Energy	273.1 kcal
Carbohydrate	51.4g
Proteins	8.1g
Fats	3.9g
Ash	1.5 ± 0.26%
Moisture	35.1 ± 0.59%
Gluten	0%

Generally, there is no ready to eat gluten free cake that is available in the Indian market. Some of the Gluten-free products available in the market are cookies, premixes, etc. and are very high in cost. We compared our product with a selected market product. The selected market product consists of Refined flour (Maida), which means it contains gluten whereas our product is gluten free and is also low in fats, which makes it a good option for health conscious people. The selected market product has a shelf life of 3 months whereas our product's shelf life is just 5 days as it is free of preservatives.

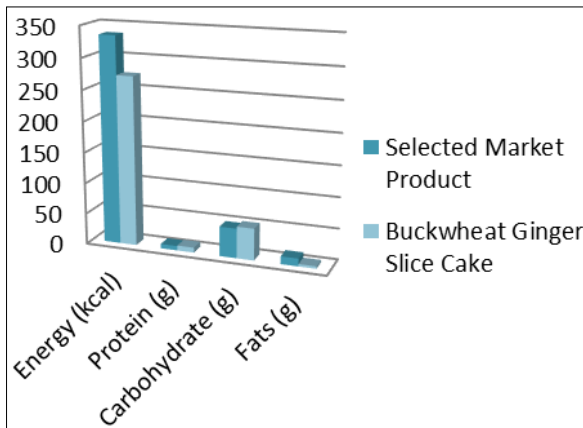


Fig 2: Product Comparison Graph

3.2. Evaluation of Microbial Analysis

The microbial load on both, Nutrient Agar (NA) and Sabouraud's Agar (SAB) was found to be less than 30 cfu/ml (colony forming units/ml), which means product is safe for consumption.

3.3. Evaluation of Sensory Analysis

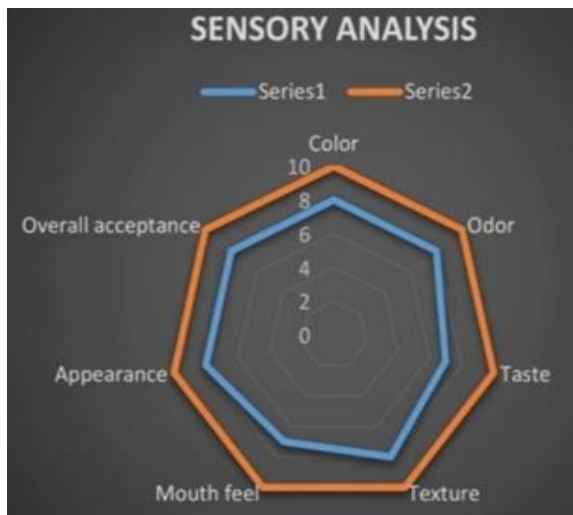


Fig 3: Sensory Evaluation result (Radar diagram)

Table 2: Observation for sensory analysis

Parameters	Average Score
Color	8
Odor	8
Taste	7
Texture	8
Mouth feel	7
Appearance	8
Overall acceptance	7

Key: 7 – Liked moderately, 8 – Liked very much

It was observed that the color and appearance was accepted positively by large number of panelists and many considered it close to slice cake while the mouth feel was not preferred by everyone. The mouth feel can be enhanced by doing modification in the process. The overall acceptability of the product is approximately 70% which is expected to increase further by making modifications to improve the quality of the product.

3.4. Evaluation of Shelf life studies

Table 3: Observation & Result of shelf life studies

Day	Observation	% Moisture
Day 1	No change in color, odor, texture and taste	35.1%
Day 3	No change in color, odor, texture and taste	37.43%
Day 5	Slight change in aroma was observed	39.03%

On Day 6, pungent odor and fungal growth was observed which was unacceptable and not safe for consumption.

4. Food Labeling and Packaging:

4.1. Packaging Material:

The material used for packaging was MET-PET/Metallized polyester, which acts as a good oxygen barrier, is leak proof and food grade.

4.2. Labeling

As per the labeling norms in India (FSSAI FSSR) and globally, a food label should include following key features:

- Name of the food product
- List of ingredients
- Nutritional information
- Specific claims
- Net weight or volume
- Batch or lot identification
- Manufacturing date
- Best before date
- Cost of the product (inclusive of taxes)
- Storage conditions
- Directions to use
- Veg or Non – Veg logo
- FSSAI logo
- Name and address of manufacturer
- Warnings, allergen information



Fig 4: Product label (front)



Fig 5: Product Label (Back)

5. Conclusion

Buckwheat Ginger Slice Cake was formulated, analyzed and studied for different proximate analysis, microbial and organoleptic analysis and shelf life studies. It can be concluded that, Buckwheat Ginger Slice Cake is gluten-free, good source of Protein (10% RDA) and a low fat product. It is also health friendly and as cake is liked by all, it can be consumed by people of all age groups as well as by those who are going through formulated diets. It is completely vegetarian and can be a healthy alternative product for those suffering from Celiac Disease or Gluten Intolerance.

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