



RAGI AND MUSHROOM GLUTEN - FREE BROWNIES

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Abstract

In a 2019 pan India study it was found that nearly 70-90 per cent of Indians were deficient in Vitamin D” [ii] . Major factor quoted was, home quarantine and other reasons being less skin exposure, clothing ,usage of sunscreens, low dietary intake of Vitamin D. etc. Vitamin D deficiency is associated with Calcium deficiency. Since, the two are inter dependent, the present study highlighted in preparing a product which might contribute these 2 nutrients thus Ragi and mushroom gluten free brownies were standardized and its shelf life was analysed. The sensory evaluation was conducted on naive panellist using a 5 point scale using a score card which took into account Flavour, Texture, Taste, Aroma, and Overall Appearance. The packaging used was cling wraps and cardboard boxes and a nutritional label was designed . The budgeting took into account- all the costs with a profit margin. Marketing was done on a digital platform. So to conclude, this product is gluten free and can cater to people with Celiac disease, non celiac gluten sensitivity, menopausal women, people suffering from PCOS/PCOD and can be consumed by people without any above mentioned categories because of its nutrient content.

KEYWORDS : GLUTEN – FREE, RAGI, MUSHROOM, VITAMIN D, CALCIUM

INTRODUCTION

Gluten free diet is complete elimination of Gluten which is a protein complex made from Gliadin and Glutenin, which bind to each other to form a network. It is present in foods like wheat, rye, barley, oats, etc. “The gluten free diet consists of purely gluten free products eg., fruits , vegetables, legumes, unprocessed meat, fish, eggs, and dairy products, wheat products exclusively manufactured without gluten or with gluten with content lower than 20ppm (European legislation)” [2]

Non celiac gluten sensitivity is a disorder which shows gluten sensitivity among patients. It is a clinical component in which ingestion of gluten leads to intestinal and/or extra intestinal symptoms. This condition can improve when the gluten-containing food product is completely removed and excluded from the diet. Therefore, a gluten free diet is recommended.

Celiac disease is caused due to ingestion of products with gluten present which causes an autoimmune response leading to damage of the inner lining of tissues. Consequently, the small intestine cannot absorb nutrients from food. Symptoms of people with celiac disease are diarrhoea, indigestion, abdominal pain, fatigue, headaches, unexplained weight loss, which cause discomfort and malnutrition. "Long-term risks related to Celiac Disease, such as lymphoma, osteoporosis and anaemia have been reported" [i]. It can be prevented by following a strict Gluten free diet.

With the Covid- 19 pandemic that has trapped all of us inside the house, most of the people are not exposed to sunlight for a prolonged period of time, as a result, causing the majority of Indians to be vitamin D deficient. "A 2019 pan-India study found that 70-90 per cent of Indians are deficient of the sunshine vitamin" [ii]

Factors that cause vitamin D deficiency are skin pigmentation (People with darker skin require more exposure to sunlight), air pollution, type of clothing (covered), and sun protection practices, lack of calcium, lack of dietary sources of vitamin D. Studies reported 80 – 90 % of prevalence of vitamin D deficiency.[4].

"Vitamin D deficiency has been associated with chronic diseases such as cardiovascular health, cancer, diabetes and autoimmune diseases. According to studies, it affects the bone density, leading to higher risk of osteoporosis in women with repeated pregnancies and lactations. Increased risk of Preeclampsia and gestational diabetes mellitus has also been linked with maternal deficiency". [3]. "Vitamin D deficiency was also associated with PCOS/PCOD, increased risk of caesarean delivery and preterm births"[3].

"The secondary hyperthyroidism SHPT is caused because of dietary calcium deficiency which fastens the conversion of 25(OH)D to 1,25(OH)2D and hence, reducing serum 25(OH)D concentrations. Therefore there persists a primary calcium and vitamin D deficiency and secondary vitamin D deficiency as result of calcium deficiency." [1] As there is a need for food products to cater to this section of population, an attempt was made to design brownies using Ragi and mushrooms which are gluten free and furnish calcium and Vitamin D in fair amounts.

OBJECTIVES OF THE STUDY include

- To standardize an innovative nutritious product which is gluten free
- To study the shelf life of the product through sensory evaluation.
- To design a Nutrition Label
- To select a good packaging material
- To understand the budget, and marketing aspects.

METHODOLOGY

The required background study was done using a computerised database Google Scholar, NCBI. With the guidance and approval of the guide, the product was finalised which was named as “**Ragi and Mushroom brownies**”.

For development of this product, there were three trials done for standardization. These trials were conducted between 14th of May 2021 and 5th June 2021 on three different days.

The first trial was on 14th May 2021 with an ambient temperature of 34°C. Followed by a second trial on 2nd June 2021 (33C) and a third trial on 7th June 2021 (30C).

The sensory evaluation of the food product was conducted using a five point scale using scoring method which assessed characteristics like Flavour, Texture, Taste, Aroma, Overall Appearance and results were recorded on the same day of the trials by 6 naive panellists.

The food product then was packaged and stored to check the shelf life of the product and sensory evaluation was done periodically to check the shelf life characteristics .

Budgeting of the product was done taking into account— the cost required for making of the product , miscellaneous costs, packaging cost, labelling cost. etc.

The nutrition label was designed and was pasted on the packaging material for marketing purposes.

For marketing the product social media and digital media platforms were used due to lockdown.

INGREDIENTS COMPOSITION

Ragi(70g) is an good source of Magnesium - 102.2mg , Potassium- 310mg , Phosphorous-147mg , Aluminium- 2.5mg , Selenium -10.71 mcg , Folate- 24mcg , Vitamin D-29mcg, Vitamin K-2mcg, Protein-5g and Energy-224kcal. Apart from these nutrients Ragi is good source of Calcium-254.8mg too.

Mushrooms(20g) are rich in Phosphorus (p) (mg)- 17.4, Calcium (Ca) (mg)- 3.6, Potassium (k) (mg)- .6, Vitamin D(mcg)- 4 and are low in calories Energy (kcal)-6.

Curd(50g) is good source of vitamin A -385, VITAMIN D (mcg)- 6.8 and calcium (mg)- 43, with low calorie in this recipe- 29kcal.

Olive oil is a good fat, energy used in this recipe amounts to 180kcal. With MUFA-16.8, PUFA – 14, Jaggery is good source of magnesium – 57.5 mg/ 50, potassium- 244mg/50g, calcium- 53.5/ 50g, Folate 7mcg / 50g. Other nutrients like phosphorous,. Folate, sodium

Sesame seeds are good source of calcium (mg) 38.4 in (3g) it is also good in nutrients like selenium, zinc, sodium, protein(0.6 / 3g) and energy (16kcal / 3g).

Dark chocolate is good for brain health with Energy 171kcal/ 30g, Protein1g/30g, carbohydrates 17.4 g/ 30g and Fat 10.8g/30g.

MATERIALS

INGREDIENTS REQUIRED TO PREPARE RAGI AND MUSHROOM BROWNIES

Sr. No	INGREDIENTS	AMOUNT gms/ ml		
		I TRAIL	II TRAIL	III TRAIL
1.	Ragi flour	70	70	70
2.	Curd	40	50	50
3.	Mushroom	20	20	20
4.	Oil	40	40	40
5.	Cocoa powder	1 ½ tsp	1 ½ tsp	1 ½ tsp
6.	Jaggery	50	60	50
7.	Sesame seeds	5	3	3
8.	Baking powder	¼ tsp	¼ tsp	¼ tsp
9.	Salt	pinch	pinch	pinch
10.	Vanilla essence	-	-	½ tsp
11.	Dark Chocolate (Morde)	-	-	30

TABLE 1

STEPS TO PREPARE

- Start by grinding Ragi into a powder and roast it in a pan for about 10-15 minutes.
- Mix all dry ingredients (Ragi flour, baking powder, cocoa powder, salt) and keep aside.
- Take a bowl, add jaggery and oil and blend well with a hand mixer or a whisk.
- Make a paste of the mushrooms in a mixer and add to the wet mixture.
- Add curd and mix it well.
- Add the dry mixture to the wet mixture gradually and mix both using a spatula with cut and fold method.
- Add 2 g of sesame seeds and 15 g of grated chocolate to the batter and keep the rest for garnish.
- Transfer the batter to the baking tray or silicon mould, garnish with sesame seeds and grated chocolate.
- Preheat the microwave for 5 to 6 minutes at 180C.
- Bake for 25 to 30 minutes.
- Cut into two inches cubes and serve.
- The stored brownie should be heated in the microwave for 30 seconds and cooled down for a few seconds before consuming.

Tips: tastes best with ice cream.

SENSORY EVALUATION

Sensory evaluation was done using a scorecard. A five point scale was designed exclusively to assess the product. The characteristics that were assessed were Taste, Texture, Aroma, Colour, and Overall Appearance. The Sensory Evaluation was carried out on 6 naive panellists. The results were noted after every sensory evaluation (before/ after standardizing and also while checking the shelf life.)

SCORE CARD

SENSORY EVALUATION FOR RAGI – MUSHROOM BROWNIES

NAME:

DATE:

Taste the product given to you and check how much you like or dislike. Use the scale to describe your feeling about the sample. An honest expression of your personal feeling will help. The characteristics to grade the product are

Grading parameters: Excellent: 5, Very good: 4, Good: 3, Average: 2,

Poor: 1.

CHARACTERISTICS	GRADE PER TRAIL		
	I	II	III
Colour	—	—	—
Taste	—	—	—
Texture	—	—	—
Aroma	—	—	—
Overall appearance	—	—	—

Signature:

FIG 1**SENSORY EVALUATION RESULTS OF THE THREE TRAILS**

As can be observed from Fig 2 the last trail had the most satisfactory results

Before standardization the texture, colour, aroma, taste, overall appearance had low results compared to after standardization. With each trail the characteristics of the brownies improved.

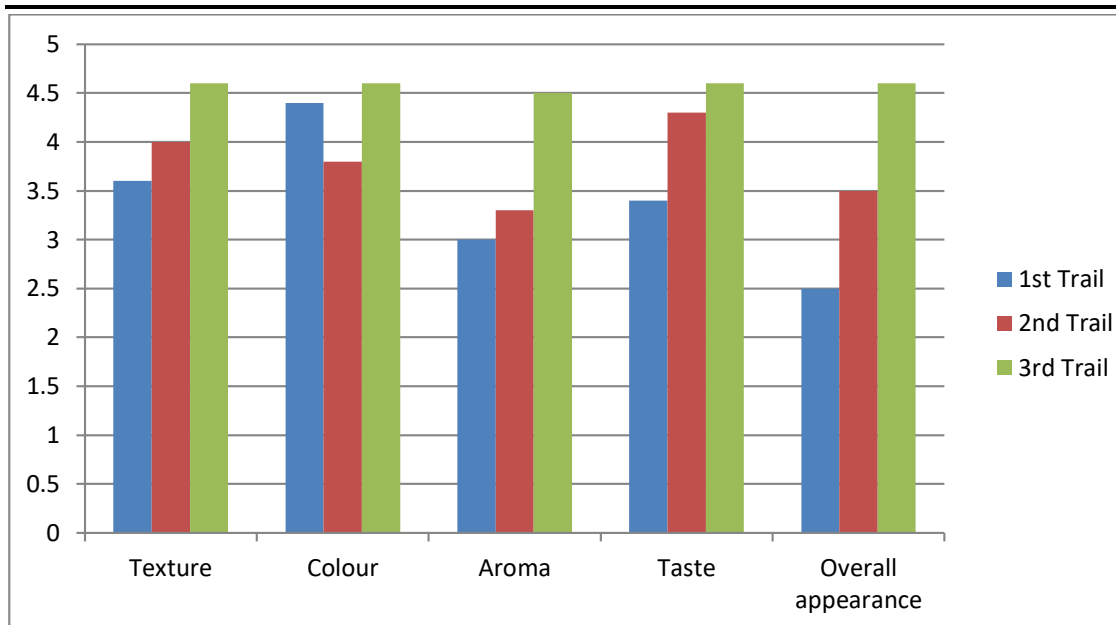


FIG 2 – Results of Sensory evaluation of the three trails

In the first trials all the five characteristics -texture, colour, aroma, taste, overall appearance had low points. The texture was dry, less sweet and more sesame seeds made it a bit bitter. In the second trail, appearance and aroma had low grade points, the sweetness and bitterness was rectified. In the third trail all characteristics had good grade points.

PACKAGING

The brownies made had a good sturdy shape. Therefore, to increase the shelf life and to protect the brownie from becoming hard and to retain the moisture it was first wrapped in a saran/ cling wrap. The brownies were then arranged in a cardboard carton to be sold in the market neatly labelled.

Plastic wraps/ cling wraps/ saran wraps or food wraps is a thin plastic film which is used for sealing food products in containers or simply packing foods to keep it fresh over a long period of time. Cling wraps remain tight over the container without an adhesive. It protects the food from chemical (gases, moisture, light), biological (micro organisms, insects), physical (mechanical) damage.

Cardboard boxes are used for packaging foods. Since, cardboards are sturdy it can store food and not damage the shape of the food product. "Cardboard boxes are made of heavy paper-like materials."(iv). This too protects the food from external physical chemical and biological damage.



FIG-3



FIG-4

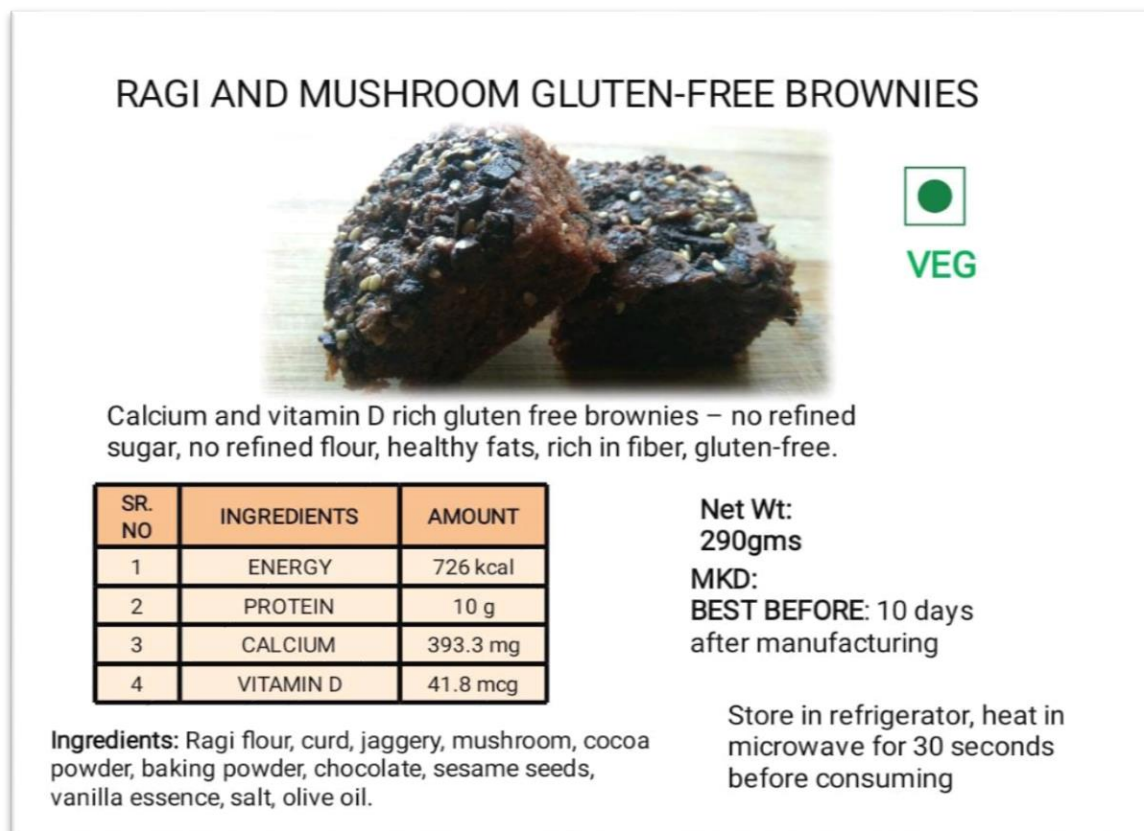
NUTRITION LABELLING

Nutrition facts labels provide knowledge about the nutrition of a particular product. This information includes serving size, number of servings in the package, calories per serving and the amount of various nutrients contained in the product. (iii)

SR. NO	INGREDIENTS	AMOUNT
1	ENERGY	726 kcal
2	PROTEIN	10 g
3	CALCIUM	393.3 mg
4	VITAMIN D	41.8 mcg

TABLE -2

Net Wt: 290g

**FIG- 5**

The nutritional label was designed with all important information like: Net Weight, Manufacturing Date, Best Before Date, Veg Logo, Nutrients and Ingredients. The nutrition label is stuck to the cardboard before sales.

SHELF LIFE

Shelf life is the duration of time that the product may be stored and be fit for consumption and use. The shelf life is therefore, studied for the knowledge of the consumer, consuming/ using that particular product and thus, the best before date was written on the packaging material. To store Ragi and mushroom brownies it has to be refrigerated for better appeal

SENSORY EVALUATION OF RAGI AND MUSHROOM BROWNIES AFTER PACKAGING

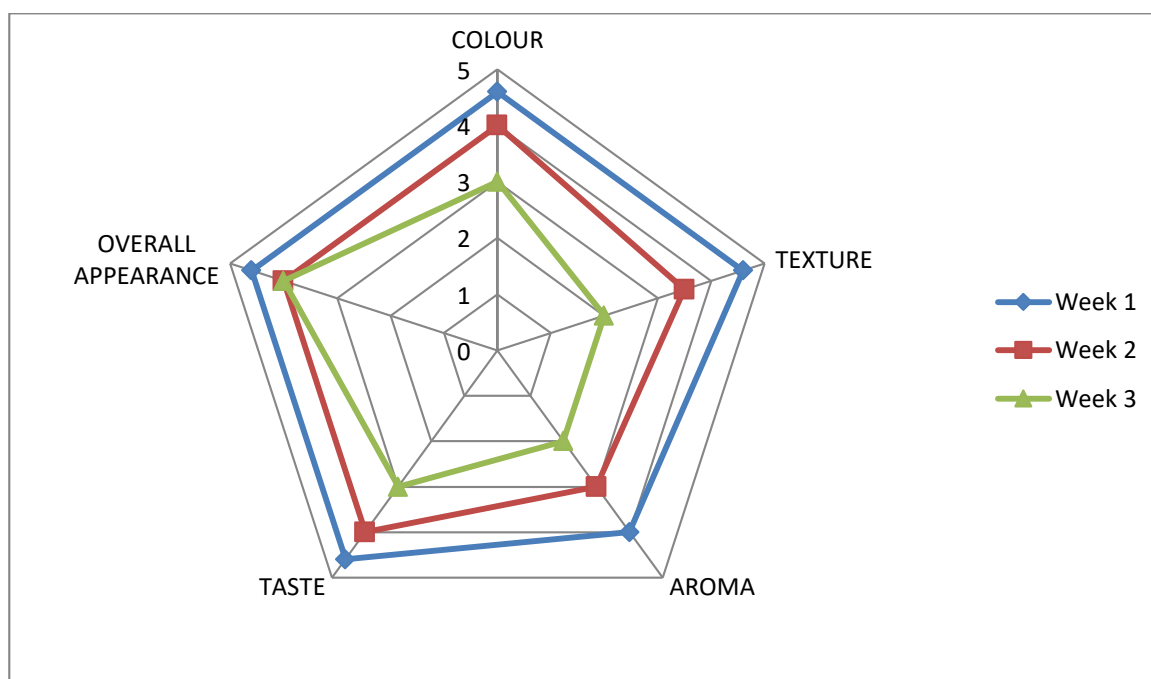


FIG – 6 Sensory evaluations of Ragi and mushroom brownies after packaging

As observed in fig-6. In the first week, all characteristics were seen to be well accepted, except for Aroma which decreased in the 3rd week. In the second week, the aroma and texture decreased and the taste, appearance and colour remained unchanged. In the third week, the aroma and texture deteriorated and the colour, taste was comparatively better. Whereas, the appearance was same as in the second week. The characteristics decreased by a point in each of the following weeks. It could be concluded that Ragi and mushroom brownies can be stored in refrigeration for 2 weeks and should be consumed within 15 days of manufacture.

BUDGETING

MATERIALS		AMOUNT (RS)
RAGI	70g	3
CHOCOLATE	30g	8
CURD	50g	4
MUSHROOM	20g	3
OIL	40g	8
COCOA POWDER	1 ½ tsp	10
VANILLA ESSENCE	½ tsp	3
JAGGERY	50g	2
SESAME SEEDS	3g	2
BAKING POWDER	¼ tsp	1
MISCELLANEOUS	-	30
NUTRITION LABEL	-	5
PACKAGING	-	20

Total amount = Rs100

TABLE -3

Total cost of a pack (4 medium sized) of Ragi and mushroom gluten free brownies is Rs 100. If the product gets sold for 150 + 30 (shipping charges). So than there is a profit of Rs50.per packet

100 packets = 5000/-

1000 packets = 50,000/-

MARKETING

Since, the product was developed keeping in mind the Menopausal women, individuals having Celiac disease and Non-Celiac Gluten-Sensitivity, , it was marketed targeting every individual even the general consumer as this product has Vitamin D and Calcium and its deficiency is prevalent due to the pandemic since all are confined in their homes .Since marketing the product physically was not possible amidst the pandemic, the product was marketed using digital platform such as- Instagram, Whatsapp and Facebook.

CONCLUSION

In conclusion, the Ragi and Mushroom brownies is gluten free and can cater to people with Celiac disease, non celiac gluten sensitivity, menopausal women, people suffering from PCOS/PCOD and can be consumed by people without any above mentioned categories because of its good nutrient content. The product was standardized, sensory evaluated by 6 naive panellists. The shelf life of this product is 15days if the product is refrigerated. The shelf life product can be improved by using dry powdered products of mushroom instead of fresh mushrooms (highly perishable).

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