



Formulation and Sensory Evaluation of Calcium Rich Crackers enriched with Finger Millet, Moringa and Sesame

¹Ms. Gauri Pillai, ²Ms. Anuradha Shekhar

¹Department of Food Science and Nutrition,

¹Dr. Bhanuben Mahendra Nanavati College of Home Science, Mumbai, India

Abstract: Intake of dietary calcium from food sources rich in the nutrient, such as Finger Millet, Moringa and Sesame, are ways to increase the calcium levels in individuals. This can be an effective approach to reduce calcium deficiency. A cracker is a crispy version of a biscuit and an attempt has been made to develop it using the ingredients mentioned above. Crackers available in the market contain refined flour, preservatives and have a high GI (Glycemic Index). The crackers developed in the present study are rich in calcium, contain fibre, proteins, and healthy fats and have anti-oxidative and anti-inflammatory properties. It is a complete protein food and could correct multiple deficiencies. The purpose of this study is to develop a snack with high calcium content naming it Calciumm Crackers, perform its sensory evaluation to determine its shelf life. The study will also look at its packaging, nutritional labeling, budgeting and marketing aspects.

Index Terms - Food Product, Sensory Evaluation, Finger Millet Flour, Moringa

I. INTRODUCTION

The nutritional requirement for calcium in the body is the highest in children aged 16 to 18 years, followed by lactating and post menopausal women and pregnant women. Intake of dietary calcium is one of the factors responsible for the calcium balance and retention for maintenance and growth. India is a developing country and the intake of calcium in the country is low compared to its western counterparts. Even though India is one of the largest producers of milk, its consumption is low. Hence, most of the calcium that comes from the diet is through cereals and plant sources. According to RDA 2020, India's average intake of calcium is as low as 300-600mg per day, whereas the EAR (Estimated Average Requirement) must be 800mg for adults and 400mg for children aged 1-3 years; increasing with age. To reduce the prevalence of calcium deficiency in the population, calcium levels need to be brought to EAR levels for good bone health during development and throughout their lifespan to maintain calcium balance even after menopause or old age, to reduce the prevalence of bone related ailments.

Snack time counts for a small meal between lunch and dinner and usually consists of a beverage with something to snack on. A snack should look pleasing, be nutritious as well as should taste acceptable for consumer satisfaction which in turn decides its quality. A mix of indigenous foods such as Finger Millet, Moringa and Sesame, if made into a snack, could be a valuable food product.

Finger millet has the highest calcium content among all the cereals (Pandian S, et al. 2017). Moringa is a super food that contains protein, carbohydrates, dietary fiber, and is a rich source of calcium iron and other micronutrients making it anti-diabetic and anticancer, also medicinal in other cerebral, gastric, microbial diseases (Gopalakrishnan, L., et al. 2016). Sesame seeds are rich in calcium and essential fatty acids (Nagendra Prasad MN, et al. 2012).

	CARBOHYDRATE (g)	PROTEIN (g)	FAT (g)	FIBRE (g)	CALCIUM (mg)
RAGI FLOUR	72	7.3	1.3	3.6	450
MORINGA POWDER	38.2	27.1	2.3	19.2	2003
SESAME SEEDS	24.05	18.08	8.54 (SFA+MUFA+PU FA)	5.5	960

Table 1.1: Nutrition values of Ragi Flour, Moringa Powder and Sesame Seed per 100g

The deficiency of calcium can be corrected by nourishing the population through the natural fortification and enrichment methods. The nutrients required to correct deficiencies and malnutrition can be balanced in the food product along with consuming a balanced diet inclusive of grains, cereals, pulses, legumes, dairy, fruits and vegetables etc. This diet provides all the required macro and micronutrients along with dietary fibre. The modified cracker is a nutritive enhanced product, which when consumed in a balanced diet can reduce multiple deficiencies, especially Calcium. The sensory characteristics of the crackers are studied further.

II. MATERIALS AND METHOD

2.1. Ingredients

For preparing the crackers, the main ingredients of the mixture were Wheat Flour, Gram Flour, Finger Millet Flour and Moringa Powder. Three trials took place with varying amounts of Moringa powder in each trial due to the strong taste.

TRIAL	WHEAT FLOUR	RAGI FLOUR	GRAM FLOUR	MORINGA POWDER (Variable)
T1	30	30	10	10
T2	30	30	10	5
T3	30	30	10	<1

Table 2.1: Amount (in grams) of main ingredients of the mixture in the three trials

Additional ingredients were sesame seeds, roasted garlic, spice mix, and rice bran oil.

2.2 Steps to prepare

1. Make the working area aseptic by pouring hot water around the work area and wiping it dry.
2. Measure the amounts of main ingredients and pour them in the mixing bowl.
3. Add salt and spices. Add hydrogenated fat and water in small amounts.
4. Mix everything well to form a tight dough and let it set for 5 minutes.
5. Make equal sized balls to roll it into a board using a rolling pin.
6. Sprinkle wheat flour to avoid the dough sticking on the board. Use a fork to prick the flattened dough.
7. Using a cutter of any shape (round/square/star etc) cut out the cracker dough.
8. Pre-heat *tawa* / pan on low flame for 10 minutes.
9. Place the cracker dough over *tawa* with equal space between each cracker.
10. Roast the cracker on each side for 5 minutes while pressing them to make it crispy.
11. After 10 minutes remove the crackers from the *tawa* and place it on a sheet to cool for 15 minutes.
12. Immediately Package.

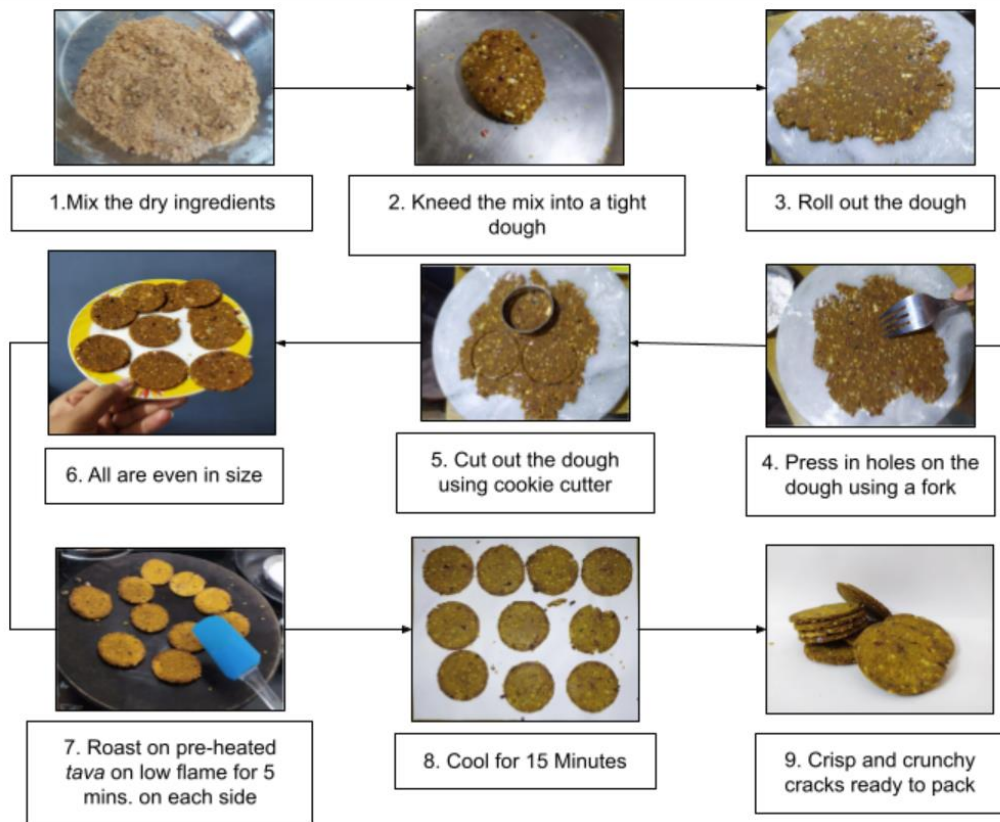


Fig.1: Preparation of Crackers

1.3 Packaging

The crackers are packed into silver pouch packets after 15 minutes of cooling. The pouch packets were not eco-friendly but a cost effective option for the study of the product's shelf life. The pouch packets are made up of 12 micron metalized polyester laminated with 20 micron natural or LDPE (low density polyethylene). It can resist the temperature up to 100 degree Celsius, it is non-toxic and leakage proof. The dimensions of the silver pouch are 5 inch by 7 inch. The pouch is useful in terms of preserving the crackers as it provides a barrier to light, oxygen, moisture and bacteria. The pouches are sealed using an electrical hot sealing machine. It heats the packet pressed in between the heating bars of the electrical sealing machine to melt and seal up the pouch.

- The crackers are roasted hence it is safer and less prone to microbial spoilage.
- The moisture content of the crackers is low.
- The product has a long shelf life.

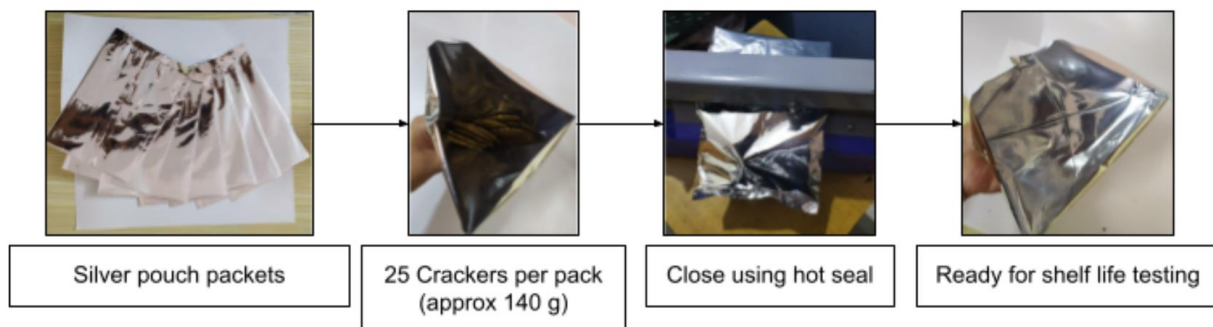


Fig.2: Packaging of Crackers

III. PRODUCT EVALUATION

3.1. Score Card

The crackers prepared using the mix of wheat flour, finger millet flour, moringa powder and sesame seeds were subjected to sensory evaluation. 5 evaluators were given a 5 point scale to score each attribute from 1 to 5, 1 being poor and 5 being excellent.

Sensory Evaluation: Scorecard for Calci-Yum Crackers

Date of Production: 14/5/21

Trial 1
Name of Evaluator: _____

Instructions: Taste the food product kept in front of you and mark a tick (✓) on the score for each attribute from 1 to 5, 1 being the lowest score and 5 being the highest score.

	1	2	3	4	5
Colour and Appearance					
Flavour					
Texture and Consistency					
Mouthfeel					

Total Score (out of 20): _____

Additional Comments: _____

Fig.3. Score Card for Sensory Evaluation

3.2. Sensory Evaluation

Trial 1

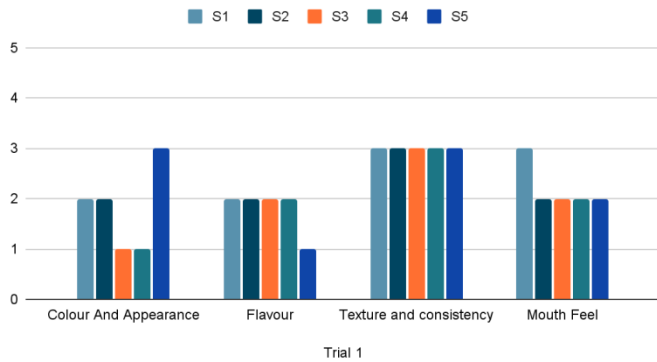


Fig.4: Sensory Evaluation scores for Trial 1

Trial 2

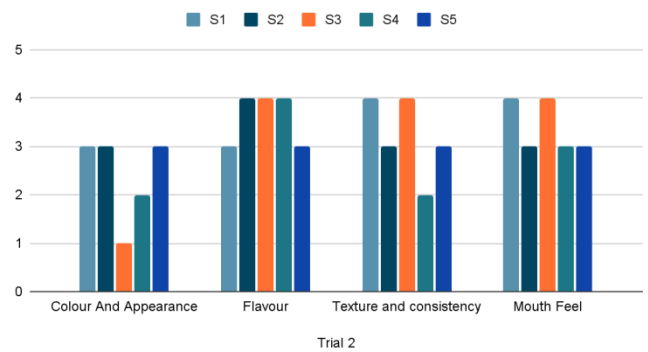


Fig.5: Sensory Evaluation scores for Trial 2

Trial 3

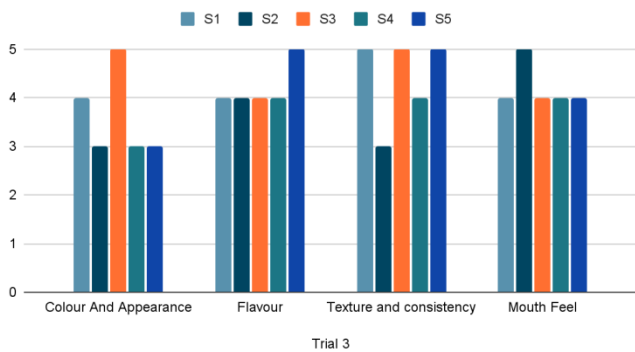


Fig.6: Sensory Evaluation scores for Trial 3

Average Score for Each Trial out of 20 from 5 evaluators.

Trials	Scores	Average
T1	10,9,8,8,9	8.8
T2	14,13,13,11,12	12.6
T3	17,15,18,15,17	16.4

Average Score for Trials

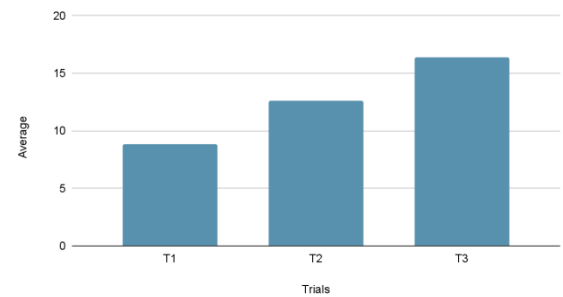


Table 3.1: Sensory Evaluation of the three trials of the crackers

Fig.7: Average Scores of the three trials

3.3. Shelf Life

After the third trial of the food product, it was kept for shelf life testing in normal room temperature conditions. The trial was conducted in the time span of 4 weeks. Each criteria was scored out of 5 (1 being Poor to 5 being Excellent) after each week.

Shelf Life Study

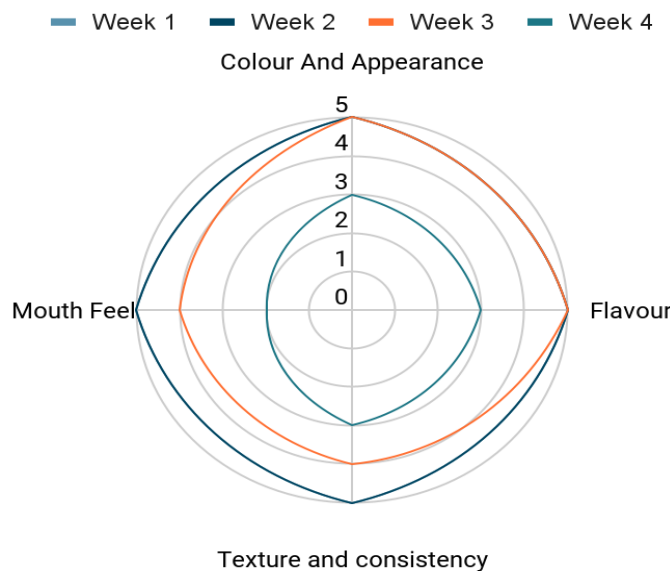


Fig.8: Shelf life web study of Trial 3 over a period of 4 weeks

Week 1: The product retains its original characteristics in terms of color and appearance, flavor, texture and consistency and mouth feel.

Week 2: The product maintains its quality even in the second week.

Week 3: The mouth feel and texture and consistency of the crackers seem slightly changed and fall from a score of 5 to 4 is observed. The other characteristics like color and appearance and flavor seem unchanged.

Week 4: The product seems to start losing its original characteristics. After the fourth week, the color and appearance, flavor and texture and consistency has come down to a score of 3, while mouth feel has come down to 2.

From the shelf life study as represented by Fig.8. , it was noted that the product is best before two weeks and can be used before three weeks of manufacture. Note that the product when removed from the packet needs to be used immediately (within half an hour) and should not be left open as it gains moisture from the surrounding and becomes soft, loses its crispness.

3.4. Budgeting

Expenditure	Cost (Rs.) of 50 pack of 140g
Ingredients	700
Packaging	100
Labeling	250
<u>Miscellaneous</u> Gas Electricity Labor Cost Rent Maintenance	80
Total	1130/-

Table.3.2: Budgeting for food product

The ingredients were bought at wholesale prices in order to reduce the costs. Table 3.2 shows the total price for raw ingredients, packaging, labeling and miscellaneous expenses for 50 packets. The final costing was Rs 22.6/- for each packet. Considering the profit margin of Rs 8/- the product was decided to be sold at Rs 30/- per packet. Total sale price for Calciyumm Crackers is Rs 1500/- for 50 packets, with an expected profit of Rs 370/-.

3.4. Labeling

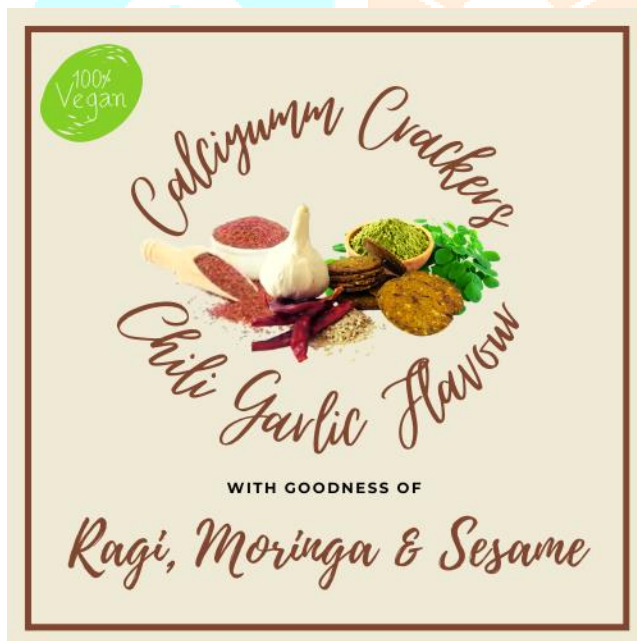


Fig.9: Front Label



Fig.10: Back Label

Nutritional labels help to evaluate food products in the market and make better health choices. The Nutrition label for Calciyumm Crackers was designed to provide facts for nutrients and its overall benefits. The front label contains the product name and that it is 100% Vegan. The back label contains information like net weight, price, and manufacturing date, major nutrients present in the product like energy, carbohydrate, protein, fibre, fats, and calcium. The label also includes the ingredients, its health benefits and the best way to eat it. Information about storage is also provided along with contact information of the food product developer.

3.5. Marketing

The product information and details was circulated in the WhatsApp group of housing society along with its nutrition label. Mothers were targeted as major consumers. Verbal reactions of most buyers stated that it is a savory snack for them and their children, and will be a healthy option for the family. Some also suggested that it has a good acceptability and can be marketed even further.

IV. CONCLUSION

Calcium Crackers is a nutritious snacking option rich in calcium which can be eaten as it is, or had with dips or toppings. The shelf life of the product is good and can last up to 3 weeks if stored in proper conditions. The only disadvantage of the product is that it gains moisture from the surrounding soon after half an hour if kept open. It is a product that is well appreciated especially by the mothers and kids and can possibly be marketed further for its nutritious value, and if made in bulk has an opportunity to provide a good profit.

REFERENCES

- [1] Nutrient Requirements for Indians, Recommended Dietary Allowances and Estimated Average Requirements- 2020, A report of the expert group, Indian Council of Medical Research, National Institute of Nutrition. https://www.nin.res.in/RDA_Full_Report_2020.html
- [2] Pandian S, Sivasankar C, Muthuramalingam P, Ramesh M. An Amazing Nutritional Value in Wonderful Finger Millet Makes This “The Most Lovable Food Crop” to the World. *Sci J Food Sc Nutr*. 2017; 3(2): 034-036.
- [3] Gopalakrishnan, L., Doriya, K., & Kumar, D. S. (2016). Moringa oleifera: A review on nutritive importance and its medicinal application. *Food science and human wellness*, 5(2), 49-56.
- [4] Nagendra Prasad MN, Sanjay KR, Prasad DS, Vijay N, Kothari R, Nanjunda Swamy S (2012) A Review on Nutritional and Nutraceutical Properties of Sesame. *J Nutr Food Sci* 2:127. doi:10.4172/2155-9600.1000127

