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SHELF LIFE STUDY OF A GLUTEN FREE NUTRITIOUS PRODUCT – TRISCUITS

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Acceptability study was conducted to see the consumer acceptance of the healthy gluten free high protein biscuit. The aim was to standardize an innovative, preservative free, simple, nutritional blend that is cost effective. The product designed was having a unique blend of Amaranth flour, Green gram flour, Lentil flour, Dates powder, Milk, Butter, Baking soda and Vanilla essence. This makes the product gluten free, having high fiber, high protein with fair amount of vitamins and minerals. The acceptance was studied by conducting a sensory evaluation using the scoring method based on a five point scale on a naïve panel. The Evaluation was performed on sensory attributes like Appearance, color, taste, texture, aroma, and overall acceptability of the product. Other parameters studied include shelf life, packaging, nutritional labeling, budgeting and marketing aspect.

Keywords: Triscuits, Amaranth flour, Beans flour, Gluten free biscuits

INTRODUCTION

Celiac disease or gluten sensitive enteropathy is a chronic disorder of the small intestine caused by exposure to gluten in the genetically predisposed individuals (Laurin *et al.*, 2002; Hamer, 2005; and Ahmed Hussein *et al.*, 2012). It is characterized by a strong immune response to certain amino acid sequence found in the prolamin fractions of wheat, Farley and rye (Hill *et al.*, 2005; and Ahmed Hussein *et al.*, 2012) when people with celiac disease eat foods or use products containing gluten, their immune system responds by damaging or destroying the intestinal villi leading to the malabsorption of nutrients, thus adversely affecting all systems of the body (Feighery, 1999; and Ahmed Hussein *et al.*, 2012). Intestinal symptoms can include diarrhea, abdominal cramping, pain and distention and untreated celiac disease may lead to vitamin and mineral deficiencies, osteoporosis and other extra intestinal problems. Until now the only treatment for celiac disease is the gluten free diet. Gluten free diet has benefits such as the recovery of the villi

of the small intestine and risk reduction of malignant complication (Seraphin and Mobarhan, 2002; and Ahmed Hussein *et al.*, 2012). As per rule the gluten free is a voluntary term and defined as food containing less than 20 ppm of gluten. Considering the importance of gluten free diet Amaranth flour along with pulses flour was used as main ingredients to make our product gluten free. The use of three different flours is the main reason behind naming the product as Triscuits meaning biscuits made from 3 different nutritional flours.

Biscuits are of 2 types one of which is the American type which is soft, leavened and baked product different from the British type which is dried and often crunchy. Biscuits today can be savory sweet at round 5cm in diameter and flat. Sweet biscuits are commonly eaten as a snack food and are in general made with various flours including some filling in it. In today's fast developing world there is great need for nutritious easy to carry, easy to store and long lasting food to keep in pace with the development. Among

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the processed foods, bakery products command wide popularity. Biscuits are popular foodstuff consumed by a wide range of population due to their varied taste, long shelf life and relatively low cost. It is estimated that 2.0-2.5 lakh tones of biscuits are manufactured annually by the organized sector and another 4.0-4.5 lakh tones by the unorganized sector (Agarwal, 1990). This amounts to an annual turnover of approximately Rs. 1200 corers. According to Selvarajan (2004) the biscuits market in recent years has witnessed a growth of 8-10% per annum.

Dietary Surveys reflect that the majority of children from all socio economic groups consume biscuits. Because of competition in the market and increased demand for healthy, natural and functional products, attempts were made, to improve the nutritive value and functionality of biscuits by modifying their composition. Therefore after looking at all the benefits, a soft biscuit was finalized after a lot of contemplations for the food product development project which was part of undergraduate syllabus in the last year of BSc course in Food science and Nutrition. The biscuits in the present study is prepared keeping in mind all the above requirement and factors. It is not only nutritious but is also gluten free.

Majority of the commercial biscuits are prepared from wheat flour and it lacks in protein quality as well as quantity. The protein content in refined wheat flours is around 10% and it is found deficient in lysine an essential amino acid. Therefore for a high biological value complete protein a combination of cereals and pulses is recommended. Cereals lack in amino acid lysine but is high in tryptophan, methionine and cysteine. Whereas legumes lack in amino acids tryptophan, methionine, cysteine but is rich in lysine. When these two food groups are combined all essential amino acids are obtained thereby improving the quality of protein (Shweta kate/B Srilakshmi).

To achieve this, Amaranth Flour along with beans flour is used to make the product. Amaranth Flour is gluten-free and protein rich flour. It is produced by grinding seeds from the Amaranth plant into a fine powder. Although technically not a grain, Amaranth yields a buff-coloured, grain-like flour that is described as nutty, earthy and grassy. Amaranth flour's protein gets high marks for quality because of its rich content of the amino acids Lysine and methionine. Considered a pseudo cereal just 150 grams of the Amaranth is all that's required to supply an adult with 100% of the daily required protein (All About Amaranth-VSA emergency

Supply). The beans flour included were Lentil flour and green gram flour. The enrichment of products with high protein legumes flours have often been proposed for bakery use (J. Sadoskaeta) Studies indicate that adding lentil and bean flours in baking products contributed to high protein high total dietary fiber, relatively high water holding capacity and good emulsifying properties to the dough (Zlatica Dhajdova *et al.*).

Research shows that legumes are considered as cheapest source of supplementary proteins in Indian diet (Swaminathan, 1974) several reports are available claiming that inclusion of legumes has many beneficial effects in controlling and preventing various metabolic diseases such as diabetes mellitus, coronary heart disease and colon cancer (Simpson *et al.*, 1981; and Shehat *et al.*, 1988). A study showed that incorporation of green gram flour (*Phaseolus Aureus*) to baked products at 1.25 times, increased iron by 1.6 times, calcium and zinc by 2 times than the control sample (Jyotsna Rajivet *et al.*). Another Study proved that substituting sugar with dates powder in baked products not only increased its nutritive value but also its physical properties like firmness and moisture content (Alsenaien *et al.*). Along with these main ingredients, milk, butter, baking soda and vanilla essence were used. Overall the triscuits gives satiety due to fiber, energy, good biological value protein, vitamins and minerals.

The best thing about the products is it has various beneficial effects, easy to prepare and is cost effective.

OBJECTIVES

1. To standardize an innovative nutritious product for consumer acceptance.
2. To Study the shelf life of the product by sensory evaluation.
3. To understand the marketing and budgeting aspects of the product.
4. To design a nutritional label.
5. To identify a cost effective packaging material.
6. To learn the various entrepreneurship skills.

METHODOLOGY

Three products namely Ragi crisps, Nutri nachos and Triscuits were initially tried out. Out of which Amaranth Triscuits were finalized based on sensory evaluation and consumer acceptability. Triscuits are a healthy snacking

option along with tea or milk, rich in fiber, protein and vital minerals.

It is specially targeted for Celiac patients, as it is gluten free, diabetic people as it has low glycemic index, elderly as it has a soft texture and easily chewable as well as other consumers can also enjoy it because of its taste, nutrition and health benefits.

MATERIALS

Materials used to prepare this product are:

Table 1: Product Before Standardization	
Ingredients	Amount (g)
Amaranth flour	20 g
Green gram flour	5 g
Lentil flour	5 g
Sugar	15 g
Milk	20 g
Ghee	10 g
Baking soda	1 pinch
Vanilla essence	2 drops

As can be observed from table no.1 the triscuits were tried out with the given ingredients. The dough was prepared and kept for 20 min in 250 °C without flipping them upside down. This made the Triscuits very hard and crispy and the acceptability was not that great. It was then decided to replace sugar with jaggery. The recipe which was modified is given in Table 2.

Table 2: Product with Jaggery	
Ingredients	Amount (g)
Amaranth Flour	20 g
Green gram Flour	5 g
Lentil Flour	5 g
Jaggery	20 g
Milk	20 g
Ghee	10 g
Baking soda	1 pinch
Vanilla Essence	2 drops

The dough was prepared and cut into shapes the tray was greased with ghee and Triscuits were then placed on it. The oven was preheated at 175 °C for 20min and then the Triscuits were placed for baking. Again a temperature of 175 °C for 1 min was set and Triscuits were flipped after every 5 min so they got baked on both sides. When the Triscuits were removed and cooled it was noticed that due to jaggery there was a lot of moisture in the triscuits and they were very soft and not at all crispy. Also jaggery contributed additional stickiness to the product and there were some granules while eating. So it was decided to replace jaggery with dates powder after taking the consumer feedback. Also ghee was replaced by butter as it gave an after taste which many individuals did not like and also butter acts as a leavening agent and gave fluffiness to the dough which is more acceptable. Thus, the recipe was further modified.

Standardisation

The final modified recipe which was accepted and standardized is as follows Table 3.

Table 3: Product After Standardization	
Ingredients	Amount
Amaranth Flour	20 g
Green gram Flour	5 g
Lentil Flour	5 g
Dates powder	30 g
Milk	20 g
Butter	10 g
Baking soda	1 pinch
Vanilla essence	2 drops

Figure 1: Sensory Evaluation for Standardized Recipe



Figure 1 (Cont.)

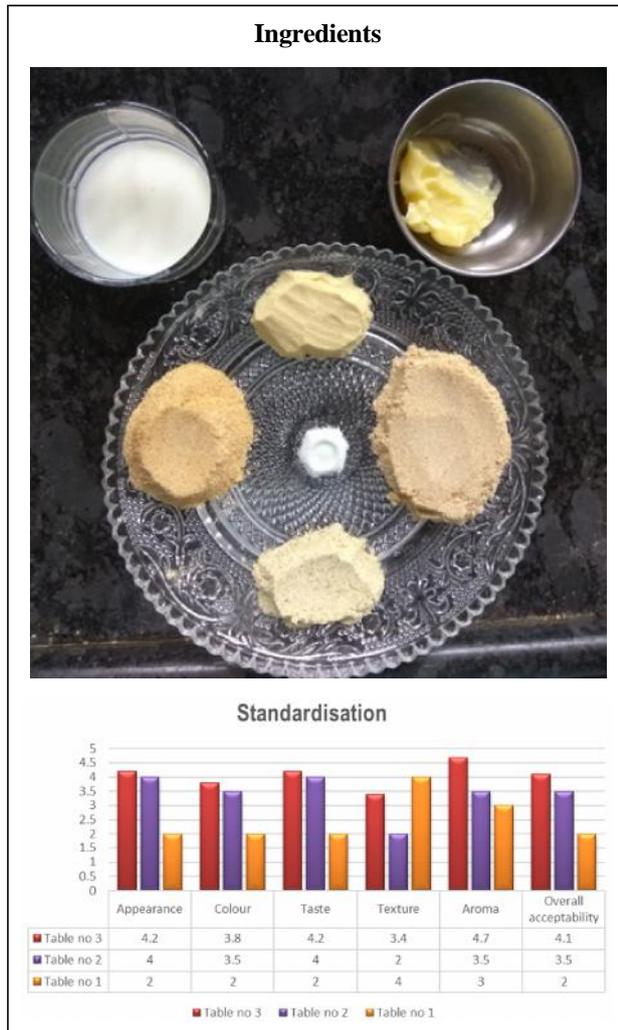
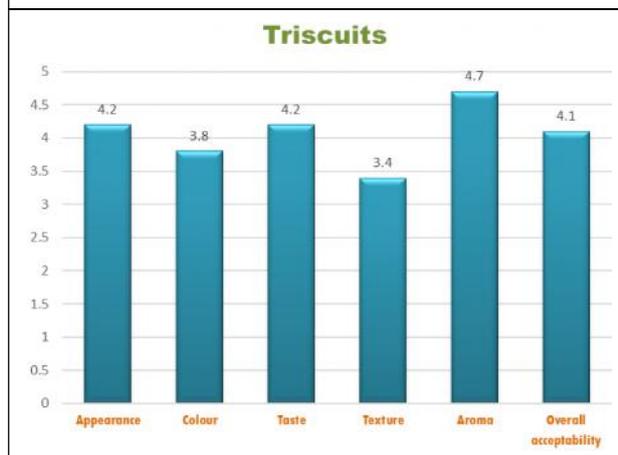


Figure 2: Results of the Sensory Attributes of the Standardized Product



This product had a better acceptability as shown by sensory evaluation results Figure 1.

Sensory evaluation was conducted by semi trained panel members by Scoring method with a 5 point scale. Attributes to be considered were Appearance, colour, taste, texture, aroma and Overall Acceptability which were scored on a 5 point scale, where:

5 = Excellent, 4 = Very good, 3 = Good, 2 = Fair, 1 = Poor

As can be seen in Figure 2 all the sensory attributes got a highly acceptable rating on a five point scale which are poor, fair, good, very good, excellent. Only the texture was rated the lowest in comparison with the other attributes since the base had no maida.

Method and Preparation

Roast amaranth flour and sieve it to get a fine powder



Soak green gram overnight after it sprouts take out the water and dry the green gram in an oven at 175 °C for 25-30 min after it becomes hard grind it into fine powder and sieve it to get a fine powder



Boil the lentil for 10-15 min to remove the water and then place them in an oven at 200 °C for 30-35 min after it becomes absolute dry hard grind it into fine powder. Sieve it if required.



Also roast dates powder and seive it properly to coarse particles

Post Preparation

Mix all the ingredients properly to make a soft dough.



Place the dough in refrigerator for 10 min



Cut shapes from the dough to make Triscuits



Grease the tray with minimum butter and preheat the oven at 175 °C for 20 min. Place the Triscuits on the tray and again set the temperature at 175 °C for 30 min Remember to flip them after 15 min



Cool it and Triscuits are ready to serve

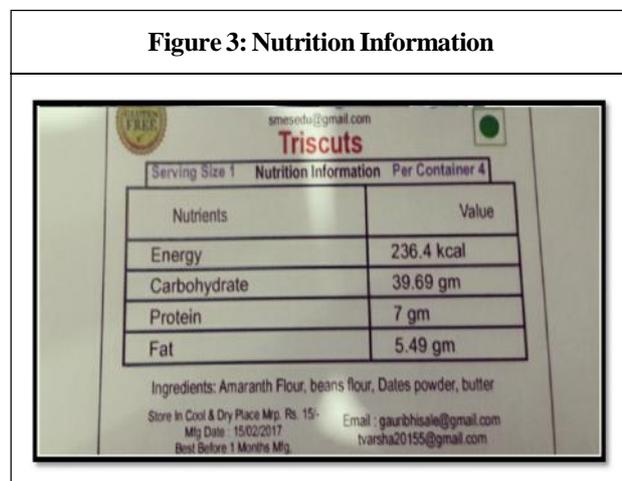
Special Tips to be Followed

1. These Triscuits should be baked at low temperature for longer time to obtain a crisp.
2. Raw Green gram and lentils contain toxic substance, Lathrogens, tannins, etc. Therefore soaking and autoclaving in an oven help to remove toxins (Food Science–B. Srilakshmi).

Nutritional Label

Nutrition information on food labels is an important public health tool to promote a balanced diet, hence enhancing public health. This information assists consumers to better understand the nutritional value of food. It enables consumers to compare the nutritional values of similar food products and then make healthy food choices based on the relevant nutrition information. For those who are on special diets (e.g., people suffering from diabetes or high blood lipid), nutrition information on food labels enables them to select suitable food and help manage their conditions. For the food manufacturer it encourages them to improve the nutrient profile of their products.

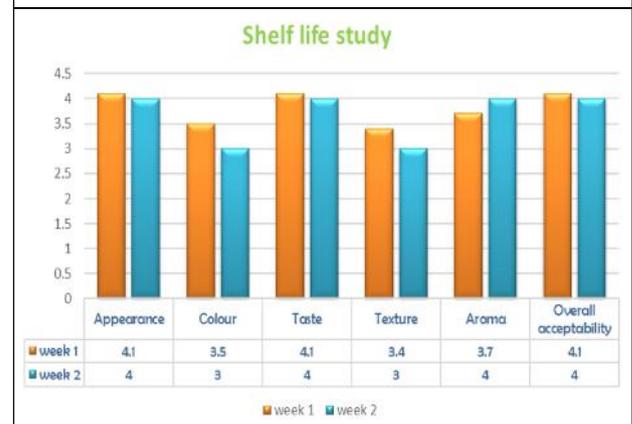
A nutritional label was designed for the product. It consist of ingredients, nutritional informational (nutrition facts), packaging date, expiry date, price. This helps to enhance the product sale for food marketing and also to attract the customers.



Sensory Evaluation for Shelf Life Study

To study the shelf life of triscuits, sensory evaluation was conducted for consecutive 2 weeks which was done by semi trained panel members (total no = 10). Scoring method was used with a 5 point scale. Attributes to be considered were Appearance, colour, taste, texture, aroma

Figure 4: Results of the Shelf Life Study of the Standardized Product



and Overall Acceptability which were scored on a 5 point scale, where:

5 = Excellent, 4 = Very good, 3 = Good, 2 = Fair, 1 = Poor

It can be observed that there were many changes in the characteristics of triscuits after sensory evaluation.

- During the 1st week the characteristics were highly rated.
- The product had good taste, appearance and overall acceptability.
- In the 2nd week there were changes in colour and texture. Also the aroma of the product enhanced. The overall acceptability was found to be very good. Thus the product had a good shelf life and can store for a period of one month.

Packaging Material

Polypropylene: It is also known as polypropylene is a

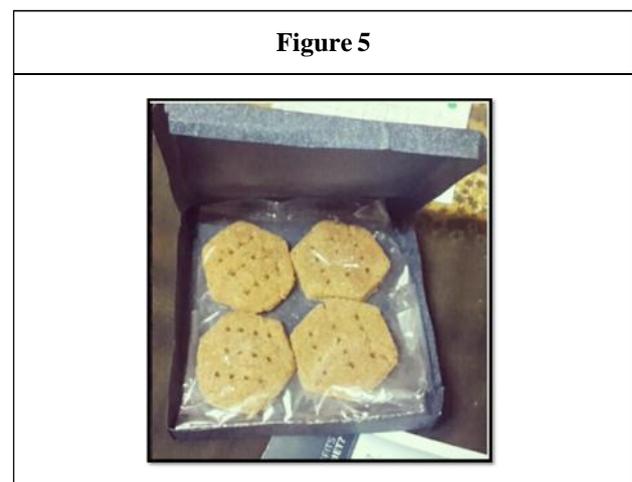


Figure 5 (Cont.)



thermoplastic polymer used in a wide variety of applications including packaging and labelling. It is normally tough and flexible, often opaque. It has a good resistance to sunlight, air, relative humidity. During processing of polymer, antioxidants (Vit. E) Are added to avoid degradation. The main idea to use this packaging material is because it is cost effective and is resistant to other sources.

Budgeting

Budgeting is an important component to achieve financial success. It makes it easier for people with incomes and expenses of all sizes with conscious decisions about the allocation of money. For the bulk production, food ingredients were bought from the wholesale market to reduce the expenses and increase the profit.

Table 4

Ingredients	Amount
Amaranth Flour (250 gm)	60
Green Gram Flour (62 gm)	5
Lentil Flour (62 gm)	5
Dates powder (375 gm)	120
Milk (250 gm)	10
Butter (125 gm)	30
Baking soda	2
Vanilla essence	2
Electricity	20
Plastic packets (15 no)	5
Label	10
Labour	20
	Rs 289/-

Actual price for 1 packet = Rs. 14.45/- but we sold it at Rs. 20/-. 20 samples were prepared and sold at Rs. 20/- each (total Rs. 400/-). The profit made was Rs. 111/- for 20 packets. Budgeting helped us to know how to improve upon the next product sales in terms of feedback collected from the target population about the pricing and other aspects.

Marketing

An exhibition cum sale was organized at SNTD Juhu where triscuits were sold. The techniques used were, giving samples to taste, approaching people and explaining them the importance of healthy snacking, explaining the advantages of triscuits. Other than this it was also sold at many other places.

CONCLUSION

Thus it can be concluded that Triscuits are nutritious and healthy. It is rich in energy and protein. It is easy to prepare and has a good shelf life. It can be consumed by any individual and a good amount of profit can be gained from it.

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