

Development of Nutrient rich bar by incorporating *Brassica oleraceae* extract and *Malus Domestica* in Ragi bar

Dhilipkumar M¹, Balasubramani V¹, Ragaventhira V¹, Balasubrahmanyam V¹, Manikandan J¹, Vasanth Anbumani P¹

¹ Student, Department of Food technology, JCT College of Engineering and Technology, Coimbatore, Tamilnadu, India.
Corresponding Author: dhilipkumarm2001@gmail.com

Abstract: - Edible bar is a concentrated food product with good nutritive value. These are high calorie foods and are a rich source of minerals and vitamins. The objective of study was conducted to improve the nutritional property of bar by incorporating *Brassica oleraceae* (Kale) leaves extract and *Malus Domestica* (Apple) in ragi bar. Kale leaves are belonging to the family *Brassicaceae*. It is a green leafy vegetable related to the vegetables such as Broccoli and cabbage. It has high nutritional content. *Eleusine coracana* is commonly known as Ragi. It is rich in proteins, fiber, minerals and antioxidants. It is normally consumed in the form of foods such as roti, muddle, ambli etc. and it helps to control the blood glucose levels. Kale leaves extract and apple pulp are mixed with ragi flour at different compositions. Palm sugar, Honey are also added and the dough is prepared and boiled at 60-70°C for 5-10 minutes. The incorporation of Kale leaves extract and apple pulp in ragi bar shows a positive result in terms of nutrient content, taste, color and appearance and shows considerable changes in physicochemical properties.

Key Words: — Bar, Ragi, Kale leaves, Apple.

I. INTRODUCTION

Edible bar is a concentrated food product with good nutritive value. These are high calorie foods and are a rich source of minerals and vitamins. It is made up of high calorie ingredients and also contains non-caloric sugars [1]. While the kale leaves and apple pulp incorporated bars have a good impact because of their nutrient content. It is a green leafy vegetable. The content of bio-active compounds of *Brassica oleraceae* (Kale) is affected by cultivars and it is necessary to identify the kale cultivars. It has been cultivated as a vegetable for more than 2500 years. The growth and commercialization of kale can be an approach to increase the dietary intake of antioxidants. One serving size of Kale provides more than 100% of R.D.I of vitamin and 45% of Vitamin-C [2,3]. *Malus Domestica* (Apple) is one of the most widely consumed fruit all over the world. They are a healthy fruit with many research-baked benefits and it contains antioxidants, Dietary fibers, vitamins and a range of nutrients [4]. It contains a good amount of carbohydrate [11%], fiber [20%], Proteins [1%], Potassium [7%], Sugar [10%]. It contains anti-inflammatory compounds and antioxidants that regulate immune responses and protect the disease like Asthma. Finger millet is commonly known as Ragi. It helps to control the blood glucose levels in diabetic patients [5]. Palm sugar is used as a sugar replacer because it has more nutritional content. It is a good source of vitamins and minerals such as Zinc, Iron and potassium [6]. The main purpose of study is to develop value added bar by incorporating apple pulp and kale leaves extract

in ragi bar. This combination of ingredients that increase the nutrient value of bar and also helps to utilize the nutrient of Kale leaves as an easy way.

II. MATERIALS AND METHODOLOGY

Ragi flour, Kale leaves, apple, palm sugar and honey were purchased from local market and were taken to the laboratory for processing. The entire process took place at Department of Food technology, JCT college of engineering and technology, Coimbatore.

A. Preparation of Ragi flour and apple pulp

Eleusine coracana (Ragi) were purchased from the local market and grinded into a fine powder. Apples were washed and remove the unwanted portions, cut into small pieces and grinded into fine paste. (Table 1) [7].

Table.1. Nutritional content of *Eleusine coracana* [Ragi] per 100 gm

Nutrients	Energy
Carbohydrate(g)	72.6
Fats(g)	1.5
Proteins (g)	7.7

Iron(mg)	6.3
Fiber(g)	3.6
Ash (mg)	2.7



Fig.1. Ragi flour



Fig.2. Apple Pulp

B. Preparation of Kale leaves extract

Kale leaves were purchased from the local market. They are cleaned well using distilled water and are separated from the stalks. Then they are diced into small pieces and grinded into a fine paste. Little amount of water is added to it and the extract is separated using a filter press.



Fig.3. Fresh Kale leaves



Fig.4. Kale leaves extract

C. Preparation of bar

Ragi flour is blended with Kale leaves extract and apple pulp at different proportions. Other ingredients are carefully measured and added in the mixture. It is mixed well until the required consistency is achieved. It is heated and added equal amount of palm sugar and boiled at 60-70°C for 5-10 minutes. Drops of honey was added for better taste and sensory property. The mixture is mixed thoroughly and poured into aluminum trays which were smeared with ghee or butter. The trays are covered and then tried for 48 hours in room temperature. Finally, the bar was cut into different shapes using a cutter, packed in small polyethylene pouches and stored at room temperature.

Table.2. Composition of ingredients

Ingredients	T1	T2	T3	T4	T5
Ragiflour(g)	100	90	80	70	60
applepulp(g)	0	10	20	30	40
Kale leaves extract (ml)	0	10	15	20	25
Honey(ml)	5	5	5	5	5
Palmsugar(g)	25	25	25	25	25

D. Sensory evaluation

The sensory evaluation study was carried out by evaluating five major sensory attributes such as taste, appearance, texture, aroma and overall acceptability using nine-point hedonic scale. Twenty members including students and staffs from the department were used for this study.

E. Biochemical physical analysis

The moisture content, crude protein, crude fiber, fat and ash content of the bar were determined using various methods. [8,9].

Moisture content: The moisture analysis of the ragi bar were determined by weighing a known amount of sample cups and then tried in hot air oven at 105-125°C.

Ash content: A known amount of sample was powdered and taken in a crucible and then burnt in a muffle furnace. By using this method, the ash content of the prepared bar was calculated.

Nutrient content: Kjeldhal method was used to estimate the protein content of the bar. The samples are first digested and the released nitrogen is converted into protein content with a conversion factor of 6.28.

- Carbohydrate content was determined using Anthrone method [10].
- Fat content in the produced bar is determined using Solvent extraction gravimetric method.
- 2,6 dichloro indophenol method was used to determine the Vitamin-C content of the bar.

Physical properties: The weight(g), thickness (cm) and diameter (cm) of the five randomly selected bar were evaluated. The spread ratio of bar was obtained by dividing diameter (cm) of the bar by thickness (cm).

Shelf life study: The prepared bar was packed and sealed in polyethylene pouches. The changes in water activity, sensory attributes such as color, texture and overall acceptance were evaluated at an interval of one month up to 3 years.

III. RESULTS AND DISCUSSION

The incorporation of Kale leaves and apple pulp in ragi bar showed enhanced nutrition content, color, texture and flavor.

The sensory evaluation of bar done and results are shown in Table 3. It is shown that bar have higher level of sensory properties in T3 sample.



Fig.5. Prepared bar

Table.3. Sensory evaluation of ragi bar enhanced with apple pulp and kale leaves.

Sample s	Appearance	Taste	Aroma	Textur e	Overall accepta bility
T1	8.10	7.85	8.15	8.10	8.05
T2	8.06	7.90	8.15	8.15	8.07
T3	8.05	8.0	8.20	8.20	8.10
T4	7.85	7.75	7.80	7.95	7.82
T5	7.70	7.60	7.65	7.80	7.68
Mean	7.92	7.80	8.0	8.0	7.90

The nutritional content of the prepared bar was determined using different methods and the results are shown in Table 4. This analysis showed that the ragi bar incorporated with apple pulp and kale leaves extract have more much essential nutrients than the usual ragi bar(T1).

Table.4. Biochemical analysis of prepared bar

Parameters	T1	T2	T3	T4	T5
Moisture%	11.70	11.0	10.54	10.31	9.38
Protein%	13.35	14.61	16.82	19.40	20.8
Carbohydrate%	68.60	70.4	71.8	73.5	74.7
Fat%	1.60	1.92	2.27	2.68	3.13
Vitamin-C%	0	5.5	8.7	11.4	14.3
Ash%	1.97	2.40	2.69	3.16	3.52

IV. CONCLUSION

The incorporation of Kale leaves extract and apple pulp into ragi bar shows considerable changes in the nutritional content and physiochemical properties of bar. The results show that with increasing addition of Kale leaves extract and apple pulp within the ragi bar recipe, increases the fat, protein and dietary fibers in the bar. It is concluded from the study that apple pulp and kale leaves are successfully incorporated ragi bar to yield bar of rich nutrition and with sensory attributes.

REFERENCES

- [1]. Amerine, M. & Pangborn, Rose & Roessler, E. (1965). In Principles of Sensory Evaluation of Foods.
- [2]. Kural, Birgül & Küçük Kent, Nurçin & Balaban Yucesan, Fulya & Orem, Asim. (2011). Effects of kale (Brassica oleracea L. var. Acephala Dc) leaves extracts on the susceptibility of very low and low density lipoproteins to oxidation. Indian journal of biochemistry & biophysics. 48. 361-4.

- [3]. Prieto, Natalia & Pham, Thu Huong & Manful, Charles & Pumphrey, Ryley & Nadeem, Muhammad & Cheema, Mumtaz & Galagedera, Lakshman & Leke-Aladekoba, Adedayo & Abbey, Lord & Thomas, Raymond. (2018). The use of natural media amendments to produce kale enhanced with functional lipids in controlled environment production system. *Scientific Reports*. 8. 14771.
- [4]. Boyer J, Liu R. Apple phytochemicals and their health benefits. *Nutr J*.2004; 3:5.
- [5]. Suneetha W, Jessie & Devi, K.B. & Maheswari, K. Uma. (2018). Development and evaluation of finger millet based ragi ball (ragi mudda) mix.
- [6]. Srikaeo, Khongsak & Sangkhiaw, Janya & Likittrakulwong, Wirot. (2019). Productions and Functional Properties of Palm Sugars. 16. 897-907. 10.14456/vol17iss2pp%p.
- [7]. Gull, Amir & Jan, Romee & Nayik, Gulzar & Prasad, Kamlesh & Kumar, Pradyuman. (2014). Significance of Finger Millet in Nutrition, Health and Value added Products: A Review. *Journal of Environmental Science, Computer Science and Engineering & Technology*. 03. 1601-1608.
- [8]. AOAC. Official method of analysis.17th Ed. The Association: Washington, DC, 2000.
- [9]. G. M. Tessera, A. Haile, E. K. Bekele. Proximate Analysis and Sensory Evaluation of Cookies Developed from Moringa Leaf Powder with Wheat Flour for Lactating Mothers and Pregnant Women. *Journal of Nutritional Ecology and Food Research* 2 (2014), 181-185.
- [10]. David T. Plummer (1990) *An Introduction to Practical Biochemistry*, 179 Third Edition.