Acta Scientific NUTRITIONAL HEALTH (ISSN:2582-1423)

Volume 7 Issue 2 February 2023

Research Article

Development of Finger Millet Based Value-Added Product Enriched with *Moringa olifera* Leaves Using Different Drying Characterization and Nutritional Composition

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DOI: 10.31080/ASNH.2023.07.1183

Received: December 19, 2022

Published: January 05, 2023

Abstract

Objective: To de Development a finger millet Composite Value-added product Enriched with Moringa Olifera leaves using different drying characterization and Nutritional Composition.

Material and Methods: Plants and Cereals can be utilized for the development of food products enriched with nutrients for all age groups of people. Considering mentioned point, the major objective of the research study was to develop a Finger millet (Ragi) fortified with a Moringa oleifera leaves-based Nutritional Bar.

Result: The moisture content of tray-dried samples is higher as compared to sun-dried samples 5.13-1.5% respectively. The protein content found in the sun-dried sample was 25.76-25.34% respectively. Nutritional bars are nutritious for health with their effects to reduce health problems like diabetes, Malnutrition. Selected T1 sample i.e., with 5% moringa leaves powder was found to have 19.8% protein,5.74% fat,16.02% fiber,1.07%Ash, and 55.26% Carbohydrate. The present investigation also deals with the mineral content present. Compared control sample 12.4% protein 9.76% fat,2.66% fiber,8.01% Ash 66.67% Carbohydrate.

Conclusion: The present investigation also deals with the minerals content present in Nutritional Bar in ppm i.e., 34.84 Ca,17.65 Mg, 2.89 Fe, 22.19 Na, 12 K, and also in Control sample 30.88 Ca,12.34 Mg, 2.11Fe, 19Na,10K per 100/g respectively. Due to less moisture content, the TPC result for 20-day -old, 5×103 CFU/g = 5000 sample, and for the fresh sample, the microbial count is absent. Vitamin C and Antioxidant are 13% and 43.63 and Present respectively. The important phytochemical compounds found in GC-MS are Vitamin E, Phytol, and n-Hexadecenoic acid (Palmitic acid), which possess antioxidant activity.

Keywords: *Moringa oleifera* leaves; Dehydration; Finger Millet (Ragi); Nutritional Bar; Proximate Analysis; Antioxidant

Introduction

Moringa oleifera is a multipurpose and exceptionally nutritious vegetable tree with a variety of potential uses. It belongs to the family *Moringaceae* of a single-genus family with 13 known species [1]. These spices originated in India and Africa and are now grown around the world. Major production includes Ghana, Senegal, and Malawi, smaller production is in New Zealand and Fiji, and more recent production is in Nicaragua and Bolivia [2,3]. *Moringa oleifera* is a small native tree of the sub-Himalaya regions of Northwest India, which is now ingenious to many regions in Africa, Arabia, and South America. *Moringa oleifera* is grown in tropical and subtropical regions of the world with a temperature of around 25-350C. The direct seedling method is followed as it has high germination rates. The tree can also be cultivated by cutting with 1 m in length and 4-5cm in diameter, but these plants may not have a good deep system. Traditionally, besides beings a daily used vegetable among people of these regions, the *Moringa oleifera* is a widely used species known and used for its name," miracle tree".

Moringa oleifera provides 7 times more vitamin C than Oranges, 10 times more vitamin A than Carrots,17 times more Calcium than milk,9 times more protein than Yogurt,15 times more potassium than Banana, and 25 times more iron than Spinach, fact that *Moringa* is easily cultivated makes it a sustainable remedy for malnutrition [4].

In ancient India, millet (ragi) (*Eleusine coracana*) was a well-domesticated plant in various states. it is traditionally called nachni (meaning dancer) in Maharashtra, umi in Bihar, etc. [5]. This is often used as a whole meal to prepare traditional foods such as roti (unleavened bread or pancakes), Mude (dumplings), and ambali (porridge). Unfortunately, in addition to the many advantages associated with these traditional foods, there is also this most the country, millet is only widely eaten by poor farmers or as animal feed in major parts of the country [6].

Various application of moringa in food products like Soup, *Moringa* leaves alone or in combination with spinach, melon, etc. can be used as soup [7]. Weaning foods*, Moringa* pollen or *Moringa* leaf powder are known to increase the nutritional value of weaning foods [8]. *Moringa* Paneer, Paneer with different concentrations of *Moringa* leaf extract, has higher nutritional content than ordinary paneer [9] Bread fortified with 5% *Moringa* found Protein and dietary fiber increased by 17% and 88%, respectively content [10].

Finger Millet grains are a potential source of 81.5% carbohydrates, 9.8% protein, 4.3% crude fiber, and 2.7% minerals. The source of crude fiber and minerals is significantly higher than wheat (1.2% fiber, 1.5% minerals) and rice (0.2% fiber, 1.5% minerals) in addition, it has a more balanced protein distribution; because it contains more lysine, threonine, and valine other millets Research shows that millet contains 11.5% dietary fiber, a Much higher fiber content than brown or polished rice.

Ragi (*Eleusine Coracana*) is an important food crop for poor marginal farmers, especially the tribal people of India. It is rich in protein, fiber, minerals viz, iron, calcium, Phosphorus, and vitamin content [11]. Finger millet (*Eleusine Coracana*), one of the minor cereals, is known for several health benefits some of the health benefits are attributed to its polyphenol and dietary fiber contents. It is an important staple food in India for people of low-income groups. Nutritionally, its importance is well recognized because of its high content of Calcium (0.38%), dietary fiber (18%), and phenolic compound (0.3-3%). They have also been recognized for their health-beneficial effects, such as anti-diabetic,anti-tumorigenic, atherosclerogenic effects, and antioxidant and antimicrobial properties [12].

Micronutrient deficiencies are now recognized as a major contributor to most of the diseases spread throughout the world. According to WHO,2003 19% of the 10.8 million child deaths globally a year are attributable to iodine, iron, Vitamin A, and zinc deficiencies [13].

Energy bars are supplemental bars containing cereals, micronutrients, and flavor ingredients intended to supply quick food energy. Because most energy bars contain added protein, carbohydrates, dietary fiber, and other nutrients, they may be marketed as functional foods, Manufacturing of energy bars may supply nutrients in sufficient quantity to be used as meal replacements. Nutritional bars are nutritious for health with their effects to reduce health problems like diabetes, and malnutrition. To develop a Finger millet (Ragi) fortified with a *Moringa oleifera* leaves-based Nutritional Bar. Millets are rich in calcium and iron, which helps to reduce malnutrition. The important phytochemical compounds are found in Vitamin E, Phytol, and n-Hexadecenoic acid (Palmitic acid), which possess antioxidant activity and are present in *moringa* leaves.

Methodology

Moringa oleifera leaves products especially leaves powder are becoming more popular because of their amazing nutritional value. However limited studies have investigated on the effects of processing and on the effects of processing and preservation on the nutritional, Physicochemical, and sensory Characteristics of these products the present investigation entitled, "*Development of Finger Millet Based Nutritional Bar Incorporated by Moringa Olifera leaves Powder*" was carried out in the Department of Agricultural Engineering, Maharashtra Institute of Technology, Aurangabad. This Chapter deals with the experimental material and method adopted for conducting the investigation. The methodologies on the reparation of *Moringa oleifera* powder and analysis of *M.oleifera* leaves to powder and Ragi *Moringa* Nutritional Bar are under the following headlines.

Material

Raw Material

Collection of *Moringaoleifera* leaves - *Moringa Olifera* Leaves collected From MIT Premises (Campus) Aurangabad. The freshly harvested Leaves are washed with tap water to remove any pesticide and foreign matter on the leaves and then they are sorted and kept for different drying processes.

Method

Preparation of *Moringa olifera* leaves powder for drying

Sorting-The fresh leaves are collected from MIT Premises (Campus) area, Aurangabad.

The stems and other unwanted parts are removed from the *Moringa Olifera* leaves during sorting.

Washing- The leaves were washed with slightly warm water to remove dirt and pesticide residue during washing and excess water was drained. Before the actual drying process, we have to take care that all water molecules present in leaves should be drained out. After draining all water molecules, the leaves are spread on the muslin cloth in thin layered in a try for the actual drying process The two types of drying techniques are used in this study sun drying and tray drying process.

Method For Drying: a) Sun drying b) Tray drying.

- **Sun drying:** In the sun-drying process, 100 g of *Moringa* leaves are weighted accurately. In this method, the fresh leaves are washed and air dried for a few minutes then put on filter paper. Filter paper with a tray placed at a place where an adequate amount of sunlight is until the constant weight is obtained and sun drying is carried out for 4-5 at a moisture content 5-6%.drying of *Moringa* leaves till store end-use.
- **Tray drying:** In the Tray drying process, 100 g of *Moringa* leaves are washed with a sufficient amount of lukewarm water till it was free from dirt and insect, and then these leaves are spread in thin layered on a tray and placed in a cabinet tray dryer at a different temperature like 40^0C for different hours until the constantly obtained drying of *Moringa* leaves till store end-use.

Ingredients for making *ragi moringa* nutritional bar

Collection of *Moringaoleifera* leaves - *Moringa Olifera* Leaves collected From MIT Premises (Campus)Aurangabad Whole Finger Millet powder, Jaggery, Ghee, and Cardamom are purchased from the local market from the Aurangabad area.

Chemicals: Chemical required for analysis are hexane, Sodium hydroxide, Sulphuric acid, Copper sulphate, nitric acid, ammonium sulphate, mercury oxide, etc. are procured from the Department of Agricultural Engineering, Maharashtra Institute of Technology, Aurangabad.

Figure 1: Processing flow chart of moringa oleifera leaves powder.

Treatment	*Moringaoleifera* Leaves powder (%) (g)	Finger millet	Jaggery
T0	Control	0	0
T1	5	35	40
T2	3	35	40
T3	2	30	35

Table a

Formulation of nutritional bar

Development of Finger Millet (Ragi)*Moringa* Nutritional Bar by addition *Moringa oleifera* Leaves

Nutritional Bar samples were prepared by blending Dehydrated *Moringa* leaves with Finger millet (Ragi) flour, Jaggery at different proportions according to factor factorial experimental design as given below

Sensory evaluation

Sensory analysis of the *Moringa* and Finger millet nutritional bar was carried out at MIT in the department of Agriculture Engineering, Aurangabad. Samples were presented to the teachers and students of the department. 3 samples of *Moringa* and Finger millet nutritional bar with varying gm (5 gm, 3 gm,2 gm) was presented to the analysts and the best sample was selected from the above-mentioned sample with the highest reading on the basis of the hedonic scale test carried out with A semi-trained sensory panel with Ten members were used in this study.

Proximate analysis

Proximate analysis was carried out for Two types of Dehydrated *Moringa oleifera* leaves samples and Three Nutritional Bar samples as *Moringa* leaves incorporated Nutritional Bar that was selected

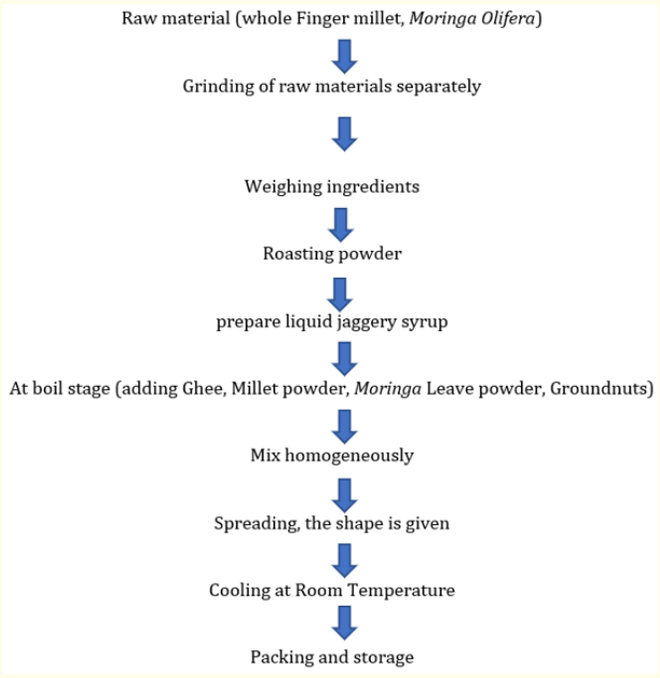

Figure 2: Processing of flow sheet for Preparation of Finger millet (Ragi)-Moringa Nutritional Bar.

from the sensory analysis along with an ordinary Nutritional Bar sample of the same recipe without adding *Moringa* leaves powder. All the Chemicals and equipment used for the analysis were obtained from the Department of Agricultural Engineering, Maharashtra Institute of Technology, University of BAMU Aurangabad. Moisture content, fat content, fiber content, protein content, and ash content were determined by the method of [14].

Determination of physicochemical parameters

Moisture content, fat content, fiber content, protein content, ash content, and microbial quantity (Total plate count) were determined in the finger millet *moringa* Nutritional bar

- **Moisture content:** Moisture content was determined in AOAC [14]

$$\text{Moisture content (\%)} = \frac{\textit{Initial weight} - \textit{final weight}}{\textit{Initial weight of sample}} \times 100$$

- **Ash**: The percent ash was calculated (AOAC [14]

$$\text{Ash (\%)} = \frac{\text{Initial weight} - \text{final weight}}{\text{Initial weight}} \times 100$$

- **Crude fat:** Crude fat was determined according to the method given in AOAC [14]

$$\text{Crude Fat (\%)} = \frac{\textit{Final weight of lflask} - \textit{weight of empty flask}}{\textit{initial weight of sample}} \times 100$$

- **Crude fiber**: The crude fiber in the sample (AOAC [14]

$$\text{Crude fibre (\%)} = \frac{\textit{loss in weight on ignition}}{\textit{weight of sample}} \times 100$$

- **Protein:** Protein content was determined with Micro-Kjeldhal per the method given by AOAC (2016).

$$\text{\% Nitrogen} = \left(\frac{\textit{Sample titrate} - \textit{blank titrate} \times \textit{H2so4} \times \textit{Vol.of digest} \times 100}{\textit{weight of sample} \times \textit{Aliquot of digest}}\right)$$

$$\text{Nitrogen} = \text{\% nitrogen} \times 6.25$$

- **Minerals content:** In daily life, micronutrients are an important part of our food. In Rag *Moringa* Bar micronutrient evaluated by method AOAC 20th Ed2016; chapter no.3 method no. 985.01.
- **The microbial analysis**: The total plate count was conducted throughout the storage period to evaluate the microbial content of the products as described in AOAC [15]. One gram of the test sample was taken and diluted in 9ml of distilled water. Added 1ml of this test sample to 9 ml of diluents (water) using separate sterile pipets, prepare decimal and dilutions up to 10-4. All plates were incubated at 35 ± 0.5 °C for 48 hours.

Result and Discussion

The result obtained from the present investigation as well as relevant discussion has been summarized under the following heads:

- **Drying Curves:** Sun drying leads to a considerable reduction of drying time by 50% and a significant improvement in product quality in terms of color, texture, flavor, and nutrient retention. For the vegetables, the dehydration process affects to varying degrees, the quality attributes may be due to vegetable type and maturity, type of pretreatment, the thickness of the vegetable pieces, and the drying method, quality characteristics were also affected by the moisture content and water activity, temperature, relative humidity and rate of rehydration. The graph was plotted between moisture content Vs time. The time was in an hour and the moisture content was in percentage.
- **Tray drying:** (Figure 3)
- **Sun drying:** (Figure 4)

Proximate analysis of *Moringa oleifera* leaves

The moisture content in the three samples of the dehydrated leaves was 5.13-1.5%. Maximum moisture was in the Tray dried sample at 5.13% and the minimum was in the Sun-dried sample at 1.5%. This result was constituted by the finding of [16]. The protein content of the three dehydrated leaf samples was in the range of 25.76-25.34/100g. The maximum moisture content is in the tray sample. Fresh *Moringa* leaves contain 9.39% protein. Fresh drum-

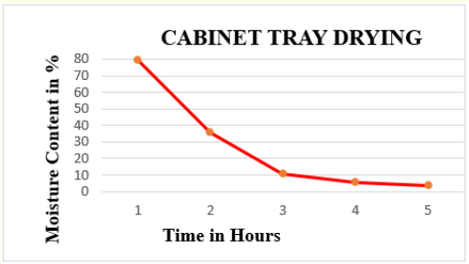

Figure 3: Moisture content of tray drying of temperature at 400 C.

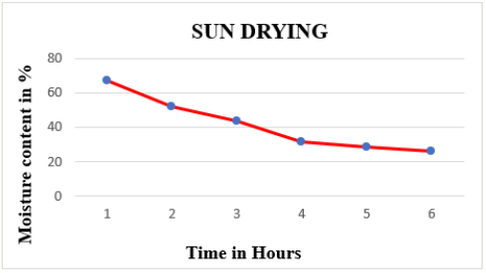

Figure 4: Changes in moisture content of Sun-dried sample.

Parameters	Fresh leaves	Sun drying	Tray drying
Moisture (%)	10.79 ± 0.47	1.77 ± 0.80	5.13 ± 2.14
Protein (%)	8.92 ± 0.60	25.34 ± 2.52	25.76 ± 0.84
Ash (%)	1.48 ± 0.34	3.99 ± 3.38	14.17 ± 2.64
Fiber (%)	5.30 ± 0.14	7.04 ± 1.63	17.82 ± 1.91
Fat (%)	4.39 ± 0.33	11.02 ± 2.50	10.43 ± 1.11
Carbohydrates (%)	66.95 ± 0.64	52.00 ± 9.74	42.78 ± 2.86

Table 1: The proximate analysis of fresh moringa leaves and sundried and Tray dried sample.

*Each value represents the value of three determinations.

stick leaves contain 9.39% protein. Compared with fresh leaves, the differences in protein content of the Two leaf samples were statistically significant ($p < 0.08$). There were statistically significant differences in protein content between the three leaf samples and fresh leaves. The fat content of the two dried samples was in the range of 11.02-4.75%. The sun tray sample had the highest fat content (11.02%) and the dried sample at 40^0 c had the lowest fat content. is 8.15%. Dehydrated leaves have the highest fat content compared to fresh leaves [17]. The carbohydrate content of the dried drumstick samples was in the range of 67-52g. The maximum carbohydrate content in the dehydrated powder of the cabinet tray dried sample is 52.00g.

The tray-dried samples had the highest fiber content (17.82 grams) The fiber content found in these processed *Moringa* leaves indicates that they are abundant and will provide volume for peristalsis, which will enhance the movement of food through the digestive canal, which has the ability to prevent colon cancer potential [16]. The results showed that the ash content of sun-dried leaves was significantly higher than that of tray-dried leaves, and the ash content of dehydrated leaves was in the range of 14.17-3.50.

Nutritional composition and physico chemical composition of ragi - *moringa* nutritional bar

Moisture content (%)	12.38 ± 1.90	Antioxidant	43.51 ± 0.32
Protein (%)	19.31 ± 1.91	Vitamin C	13.09 ± 0.14
Fat (%)	16.29 ± 0.72	Added Sugar	9.57 ± 0.21
Fiber (%)	16.55 ± 3.36	Reducing sugar	0.01 ± 0.00
Ash (%)	3.41 ± 2.11	Total sugar	0.17 ± 0.22
Carbohydrate (%)	48.33 ± 6.15	Free Fatty Acid	1.58 ± 0.19
Energy (Kcal)	384.76 ± 54.66		

Table 2: Nutritional Composition and Physico Chemical Composition of Nutritional Bar.

*Each value represents the average of three determinations.

Values are the means of triplicate determination on a fresh weight basis; means within rows with different superscripts differ significantly.

The result of the proximate composition of Nutritional Bar produced from *Moringa* and Finger millet flour are given in Table: 1 there were significant differences in the proximate composition of the various blends of Ragi-*Moringa* Nutritional Bar in this study when compared to the control. An increase in protein content was observed with an increase in the level of *Moringa* addition. In this excepted as *Moringa* is noted for its high quality and quantity of protein. Cereal grains are limited to two essential amino acids, Lysine, and tryptophan. Finger Millet, can be used in many ways and is a great substitute for other grains such as rice and other starchy grains. These products are either in practice or have been proven to increase This special millet. therefore, the addition of *moringa* will be good and complement therefore producing a better nutritional quality Ragi-*moringa* Nutritional bar. This agrees with previous reports on *moringa* and Ragi Value added products. The higher fiber and protein content of the Ragi-*moringa* Nutritional bar is a justification for the nutritional importance of *Moringaoleifera* and finger millet.

The utilization of fiber-rich plant foods aids in transportation through the gut (laxative) and lowers blood cholesterol, thereby helping to control some prevalent chlorin diseases, Diet Increased fiber intake also provides more vitamins and minerals. The high ash content observed suggests that *Moringa* is rich in minerals, with 25 times more iron than spinach alone, which can enhance recall during tests and exams [18]. Millet grains contain a lot of health-promoting ingredients such as dietary fiber, minerals, vitamins, and phytochemicals including phenolic compounds, and They are comparable to major grains and also have several potential health benefits. However, novel processing and Preparation methods are needed to improve the bioavailability of Micronutrients and improve the quality of millet diets the importance of gluten is well-known Production is easy to handle [19]. Function and nutritional activity have been studied and compared to other grains, refers to millet is rich in various minerals, Antioxidants, Fatty Acids, and Minerals The Importance and Significance of a Healthy Nutrient-Dense Diet is necessary to maintain a healthy life. it can help people in rural areas as a dietary supplement for Malnutrition due to lack of energy protein [20]. The result of this study also shows a significant decline in Fat contents. foods of low fat are likely to keep longer as they are less prone to rancidity.

Mineral composition of ragi-*moringa* nutritional bar

Values are the means of triplicate determination on a fresh weight basis; means within rows with different superscripts differ significantly.

Composition	Trace element Ragi- *Moringa* Nutritional Bar of concentration Mg/100g
Sodium [Na]	23.67 ± 1.53
Potassium [k]	14 ± 2
Calcium [Ca]	33.45 ± 1.22
Magnesium [Mg]	15.92 ± 1.72
Iron [Fe]	2.71 ± 0.41
Manganese [Mn]	0.25 ± 0.03
Zinc [Zn]	0.12 ± 0.04
Lead [Pb]	0.08 ± 0.04
Nickel [Pi]	0.04 ± 0.04
Copper [Cu]	0.03 ± 0.03

Table 3: Mineral Composition of Ragi-Moringa Nutritional Bar.

*Each Value represents the average of three determinations.

Sensory evaluation of ragi-*moringa* nutritional bar

The Ragi-*Moringa* Nutritional Bar from different levels of *Moringa* leaves Nutritious bar and control sample were subjected to sensory evaluation for Color, Texture, Crunchy, Hardness, Sweetness, Rancidity, and overall acceptability. The results of sensory evaluation Table 4. indicated that all the Ragi-*Moringa* Nutritional Bar samples were generally acceptable and the values were compared with Rasik *Moringa* Snacks Bar (control sample).

Quality Attributes	T0	T1	T2	T3
Colour	8	9	8	8
Snap (Texture)	4	8	7.4	7
Crunchy	2	7	6.8	7
Hardness	1	7.5	7.4	7
Sweetness	1	7.4	7	7
Rancidity/Peanut Flavor	0	6.2	6.5	6.3
Overall Acceptability	5	8	7.7	7.6

Table 4: Sensory evaluation of Ragi-Moringa Nutritional Bar.

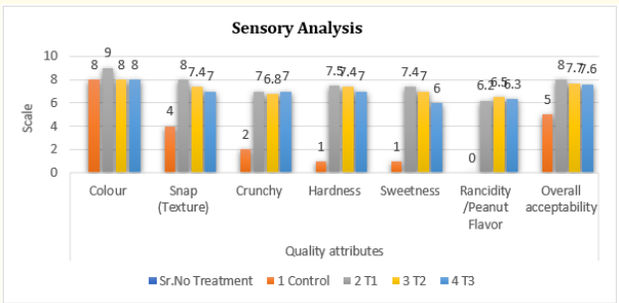

Figure 5: Graphical presentation on sensory evaluation of Ragi-*moringa* Nutritional Bar.

The graphical presentation of the Nutritional Bar indicated that all the Nutritious Bar samples were generally acceptable, and the values were compared with Ragi-*Moringa* Nutritional Bar from the Rasik *Moringa* Snacks Bar (control sample). The result showed T1 (5 gm *Moringa* leaves to powder and 35gm substitution)improved Color, Texture, Crunchy, Hardness, Sweetness, Rancidity, and overall acceptability of Ragi-*Moringa* Nutritional Bar by 9-point Hedonic scale. While T2 and T3 (with gm *Moringa* Powder,40 gm Finger Millet and 2% *Moringa* Powder,35 gm Finger Millet powder respectively). The Ragi-*Moringa* Nutritional Bar from (5%)*moringa* addition was most preferred.

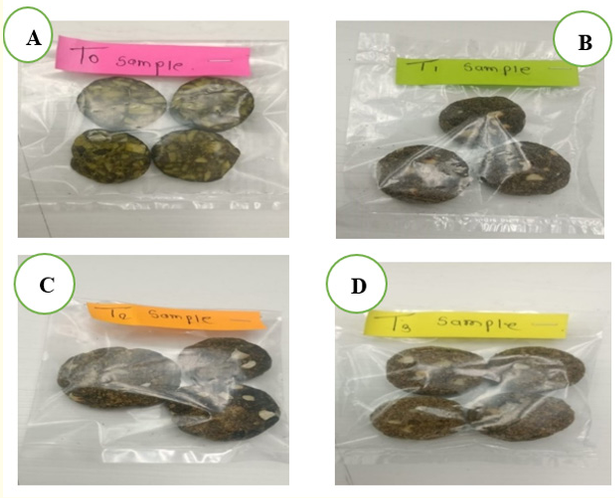

Figure 6: Samples images of Control, T1, T2 and T3 sample.

Textural properties of ragi-*moringa* nutritional bar

Hardness**:** The maximum force obtained during the first bite. Customers may feel uncomfortable because they are crunchy, brittle, or brittle.

Name of Parameter	Area
Hardness	4852
Adhesiveness	0.00 mi
Cohesiveness	002
Gumminess	105.00g
Chewiness	1,00 mj
Springiness	0.25

Table 5: Textural Properties of Ragi-Moringa Nutritional Bar.

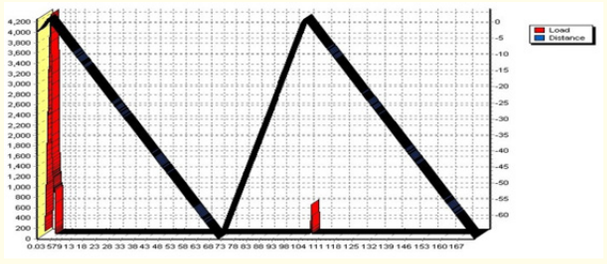

Figure 7: Textural properties of Ragi-Moringa Nutritional Bar.

Use the TA7 probe to penetrate the centre of the Ragi-*Moringa* Nutritional Bar speed of 1 nm/s. use Texture expert software to record the maximum force. Similarly, the TA 7 probe was used to measure the hardness.

GC-MS chromatography mass spectrometer

GC-MS QP 2020 GC was used in the analysis employed as a fused silica column, packed with SH-Rxi-5 Sil MS (5% biphenyl 95% dimethylpolysiloxane, 30 m × 0.25 mm ID × 0.25µm df) and the components were separated using Helium as carrier gas at a constant flow of 1.28ml/min. The injector temperature was set at 250°C during the chromatographic run. The extract (0.2µL) was injected into the instrument and the temperature was 110 °C (2 min); followed by 200 °C at the rate of 10 °C min 0; and 280 °C, where it was held for nine minutes. The mass detector conditions were, transfer line temperature at 200° C; ion source temperature 250 °C; and ionization mode electron impact at 70 eV, with a scan time 0.2 seconds and scan interval of 0.1 seconds. The fragments from 40 to 600 Da. The spectrums of the components were compared with the database of the spectrum of known components stored in the GC-MS NIST library.

GC-MS of the ragi-*moringa* nutritional bar extract

This Nutritional Bar GC-MS extract finds Most of these compounds have been associated with several biological or pharmaceutical properties which are responsible for the medicinal potential of the plant [21]. have reported that n-Hexadecenoic acid (Palmitic acid) possesses anti-inflammatory, and many other properties, and also Tetradecanoic acid compounds are used for pharmacological activity as larvicidal and repellent activity. Identification of the water content of *M. leaves* water extracts by GC MS. Ragi-*Moringa* Nutritional Bar The GC-MS spectrum of the aqueous extract of *M. Oleifera leaves* is as shown in Tables it reflects peaks for many biomolecules few mentioned above Tables. Plant composition, retention time, peak area percentage, and molecular weight. Chemical structure of active substances components and their known key applications such as medicine, cos-mechanics, etc. phytochemicals come in a variety of Industrial applications and medicinal properties such as antitumor, Anti-cancer, insulin regulation, antioxidant, etc. an amazing plant, edible, medicinal, food and suitable natural ingredient explore its further applications in different fields such as cosmetics, personal care products, etc.

Microbial analysis of ragi-*moringa* nutritional bar

It evident from the data presented in table 7. On the first day it was observedthat there is no count was detected in Ragi-*Moringa* Nutritional Bar on storage days. The microbiological analysis of the Ragi-*Moringa* Nutritional Bar at different storage periods showed the total plate counts.

For the growth of microbial species, I used plate count agar which was good for their overall growth and development. It was incubat-

Parameter	Sample	Day	Dilution Factor	Colony Factor T1 sample	Result
TPC	After 10 days	11	10^3	2	2×10^3 CFU/g = 2000
TPC	After 20 days	21	10^3	5	5×10^3 CFU/g = 5000

Table 7: Microbial analysis of *Ragi-Moringa* Nutritional Bar.

ed at 30ºC, and this premix powder was preserved at room temperature. Microbial analysis of the Ragi-*Moringa* Nutritional Bar was done successfully. TPC was observed for 1-month days respectively and it was below the safe limits.

Conclusion

Therefore, the conclusion from the research work is that compared to my research project *Moringa* leaves are dried by using two different methods and different proportions, and a Cabinet tray dryer (40^0C) was found best for the production of Finger millet and *moringa* nutritious Bar and organoleptic properties. The result showed that 5% *Moringa* Leaves powder and 35% finger millet (Ragi) powder is considered the best because all sensory quality characteristics of the product were the same as compared to the control. Where a high amount of 19.8% protein. The fat and fiber contents are 2.66% and 8.01%, carbohydrate and moisture content of the nutritional Bar are 48.33% and 12.38% respectively. Compared control sample 12.4% protein 9.76% fat, 2.66% fiber, 8.56% Moisture 54.71% Carbohydrate respectively. The present investigation also deals with the minerals content present in a nutritional bar in ppm i.e., 34.84 Ca, 17.65Mg, 2.89Fe,22.19Na, 12, K, and also in Control samples 30.88 Ca,12.34Mg, 2.11Fe, 19Na, 10K per 100/g respectively. Vitamin C and Antioxidant are 13% and 43.63 and Present respectively. The textural property hardness of the sample is 4852g, and adhesiveness is 0.00 mi, the compression test was done by using a load cell of 10000g, 1 nm/s. test speed, Gumminess 105.00 g, chewiness 1,00 MJ respectively. Due to less moisture content, the TPC result for 20-day -old, 5×10^3 CFU/g = 5000 sample, and for the fresh sample, the microbial count is absent. Phytochemical compounds found in GC-MS are Vitamin E, Phytol, and n-Hexadecenoic. This energy bar will be useful for malnutrition people children or sportspersons.

Acknowledgments

I am grateful to all those who have been fortunate enough to work with me on this and other related research Every member of my dissertation committee has provided me with extensive personal and professional guidance and taught me much about research and life. My special thanks go to my head of Dept. Dr. D. T. Bornare (Agricultural Engg.) As my teacher and mentor, he taught me more than I could give here.

Conflict of Interest

None.

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