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Studies on quality evaluation of ragi incorporated with *Moringa oliefera* powder crackers

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Abstract
In daily consumption people likes to eat Crackers at morning snakes or an evening snakes. Consumer demand to eat healthy and nutritious food that's why we use health incorporating natural ingredients. The natural ingredients includes finger Millets (Ragi) due to rich source of calcium, *Moringa oliefera* Leaves Powder rich source of Calcium. The formulation of Ragi incorporated with *Moringa oliefera* Leaves Powder Crackers were made by varying levels of ingredients by 3 trials T1, T2 and T3. Among the trials T3 was selected by highest score with following proportion of Finger Millets, *Moringa oliefera* Leaves Powder and other ingredients as 30:10:50. The Process for Ragi incorporated with *Moringa oliefera* Leaves Powder Crackers begins by grinding Finger millet and *Moringa oliefera* Leaves Powder. After roasting Finger Millets are grinded and *Moringa oliefera* Leaves dried in dries and make a powder by using grinder than all the flour mixed by adding salt and required spices. After mixing dough was prepared and rolled into thin sheet by cutting with molder and baked at 150^0c for 20 min. Proximate composition of Ragi incorporated with *Moringa oliefera* Leaves Powder Crackers were sample T3, Carbohydrate is 64.67gm, the protein content is 9.96g, The Ash content 2.09g, fat content 14.79g. Energy values was found to be 431.63 Kcal as the moisture content is 8.49g, the total sugar is 18.86g respectively. Sample T3 best among all the levels Incorporated *Moringa oliefera* Leaves Powder Crackers prepared recorded highest score in all the quality attributes with highest source of protein, Calcium and other micro nutrients. It was concluded that the Incorporated *Moringa oliefera* Leaves Powder Crackers can be stored in HDPE for 2 months at room temperature. So the Incorporated *Moringa oliefera* Leaves powder Crackers can be satisfy the consumer in accepts and quality.

Keywords: Ragi, *Moringa oliefera* Leaves Powder, formulation, crackers, proximate analysis, HDPE, storage study

Introduction

Snack crackers are also known as savory crackers, cocktail crackers, or cheese crackers. They come in many different flavors, shapes and sizes. Some are topped with items such as seed, herbs cheese, and salt. The most common shape after cutting that is reincorporated back into the mixer or into the dough during sheeting. Snack crackers are prepared using in single stage mixing process in which all of the ingredients are mixed together at once to make dough which then may or may not be rested is dough is then sheeted, laminated cooked and baked. Most snack crackers are sprayed with oil they leave oven the oil gives the crackers a shiny appearance imparts flavor and helps any applied topping adhere to surface.

Crackers are mainly manufactured from flour and water with relatively small quantities of shortening. some crackers dough can be prepared yeast as the leavening for either long or short fermentation times. The sponges –and –dough method can be used although the long fermentation time dose not fit well into modern manufacturing methods. Some crackers dough are chemically leavened using either reducing agent and or proprietary enzymatic mixtures of amylase and protease (Diane Misklly, 2017).

Finger millet is commonly known as Ragi (*Eleusine Corcana*). It is annual herbaceous plant. It originated from East Africa. It belongs to *Poaceae* family. It grows in tropical and arid climate. It has polygonal rhombic shape. It is small in size, varying Diameter (1-2mm). Its colour shades ranging from Red to almost Black. Finger Millet contains Moisture (12%), Protein (4.9-11.3%), Fat (1.3-1.8%), and Carbohydrates (72%). It also contains Vitamins like thymine (0.42mg), riboflavin (0.19mg), niacin (1.1mg), minerals (2.7gm). (Shobana *et al.* 2013) [21].

The interest in finger millet due to its health benefits namely, hypoglycemic characteristics and also antimicrobial and antioxidant activities of its polyphenols have been growing. Evidence has long shown that patients with diabetes tolerate finger millet better than rice and that there blood sugar levels are lower. Ragi is an ideal food for the obese because its digestion is slow due to which the carbohydrates take a longer time to get absorbed. By eating preparations made from Ragi, the constant desired to eat is curbed, thus reducing calorie intake. At the same time it supplies and abundant quantity of calcium, phosphorus, iron, vitamin B1 and B2 and prevents malnutrition in restricted food intake. Phytochemicals found in Finger millets are trypsin inhibitor, hemagglutinin, goitrogenic agents, cyanogronic glycosides, alkaloids, tannins, phytates and saponins. (Patel *et al*, 2016) [1].

Moringa oleifera is one of the lesser known vegetables found in Nigerian ecosystem with highly nutritious leaves, significant source of ß-carotene, vitamin C, iron, potassium and protein. Its protein quality compares very well with that of milk and egg. To alleviate the problems of malnutrition as a result of inadequate diet in developing countries, there is need for a cheap and available source of protein like Moringa leaves as food enricher since animal protein is very expensive and beyond the reach of the common man. (Gardener and Ellen, 2002; Emelike *et al*., 2015 [27]; Suchada *et al*., 2010) [28].

The leaves of M. oleifera are a good source of protein, vitamin A, B and C and minerals such as calcium and iron.

The leaves are outstanding as a source of vitamins A when raw as a source of vitamin C. They are also good sources of vitamin B and are among the best plant sources of minerals (Dahot, 1988 [29]; Talhaliani and Kar, 2000).

Moringa leaves have been consumed by Asian people for millennia as a healthy food product. Studies from other countries indicate that the leaves have immense nutritional value such as phytochemicals, vitamins, minerals, and amino acids (Anwar *et al*., 2007 [32]; Busani *et al*., 2011).

Moringa leaves are known to have a high content of essential amino acids, proteins, minerals and vitamins, hence an ideal nutritional supplement (Fletcher, 1998).

Recently consumer demand has increased for healthy snacks. Snack crackers are popular as healthy snacks and there is a high potential to enhance the nutritional value by incorporating natural ingredient. In the present study, the nutritional content of the snack crackers was improved by using Finger millet and Moringa oliefera Leaves Powder.

Material & methods

Procurement of Raw Material

Raw materials required during present investigation were procured from local market of Saralgaon such as Ragi flour, Wheat Flour, Besan, Moringa leaves Powder, cumin powder, carom seed, salt, Red chili etc. the raw material were cleaned and made free foreign matters.

Physical Properties of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

The colour of Ragi incorporated with Moringa oliefera Leaves Powder Crackers was determined by visual observations, the length, breadth and width of Ragi incorporated with Moringa oliefera Leaves Powder Crackers was measured by vernier caliper. The weight of Ragi incorporated with Moringa oliefera Leaves Powder Crackers was measured on analytical weighing balance.

Chemical Properties of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Proximate composition such as moisture, ash, crude fat, crude protein and crude fiber of all the Ingredients and Ragi incorporated with Moringa oliefera Leaves Powder Crackers was determined according to the procedures given in AOAC (2000). For moisture determination samples were dried in oven at 130ºC for 60 minutes. For ash determination samples were placed in muffled furnace at 550ºC to burn out all carbon compounds leaving in organic part (ash). Fat was determined by fat extraction unit by using n. Hexane. For fiber determination, samples were treated with 1.25% Sulphuric acid and Sodium Hydroxide solution. After filtration of digested material it was washed with hot water and then ignited. By calculating loss of weight after ignition, crude fiber contents were determined. Protein contents were determined by using Kjeldahls unit.

Sensory Evaluation Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Prepared product were evaluated for sensory characteristics in terms of appearance, color, flavor, aftertaste, texture and overall acceptability by 10 semi-trained panel members comprised of academic staff members using 9- point Hedonic scale. Judgments were made through rating the product on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 ‘like extremely’ to 1 ‘dislike extremely’. The obtained results were recorded in sensory score card.

Statistical Analysis

The analysis of variance of the data obtained was done by using completely randomized design (CRD) for different treatments as per the method given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of $p<0.005$ level S.E and C.D. at 5 percent level is mentioned wherever required.

Formulation of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Crackers prepared with incorporation varying levels of Finger Millet, Moringa oliefera Leaves Powder and other ingredients were investigated. The formulation was made by varying levels of Finger Millet a *viz.*, 00:00, 20:20, 25:15 and 30:10 percent respectively. Sample T3 of crackers were organoleptically acceptable and used for further study.

Preparation of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Process for Preparation of Moringa oliefera leaves powder

Moringa leaves harvested than Leaves are then rinsed in clean water to remove dirt. Leaves should be dried in an area protected from light to prevent the loss of vitamins and protected from dust and pests to prevent contamination. If necessary, leaves can be covered by thin cloth or mosquito netting to help keep them clean while drying. Dried leaves can be made into powder using a grain grinders. Once the dried leaves have been transformed into a powder, the powder is sifted to remove any remaining stems and stored in air tight container.

Flow Sheet for Preparation of Moringa oliefera leaves powder

Leaves harvest

↓

Drying leaves (Leaves should be dried in an area protected from light to prevent the loss of vitamins and protected from dust and pests to prevent contamination

↓

Grinding leaves (Dried leaves can be made into powder using grinders)

↓

Powder ↓

Storage

Process Preparation of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

First step is selection of raw material or ingredient and then weighing and cleaning, then add the spices and other ingredient, then mixing these all ingredient in to a bowl, add water for making smooth dough. Kneading is the process for dough mixing well make it smooth cohesive mass. Then after the dough of mixture is rest for 15 min conditioning. Roll the dough and thin layer and then cut it into triangle shape, Pre heating the oven for baking process, at 175 °C for 15 to 20 min. after the baking process cool at room temp and storage.

Preparation of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Selection of raw material
↓
Weighing and cleaning
↓
Add spices or other ingredients
↓
Mixing
↓
Add a water for making smooth dough
↓
Kneading
↓
Conditioning (15min)
↓
Rolling and cutting
↓
Preheating oven
↓
Baking (175˚C for 15-20min)
↓
Cooling
↓
Storage

Result and discussion

Physical Properties of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Table 1: Table of Physical Properties of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Sr. no.	Parameter	Observation
1	Colour	greenish
2	Shape	Square
3	Length	2.5cm
4	Breadth	2.5 cm
5	Width	0.2 cm
6	Weight	2.02 gm

Physical properties of Crackers observed that the Colour of Crackers was Greenish which was determined by visual Observation. The shape was square with length and breadth of crackers 2.5cm with width 0.2 cm. The weight of 1 cracker was 2.02 gm.

Chemical Properties of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Table 2: Table Chemical Properties of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Parameters	Sample T2 (%)
Energy value	431.63(Kcal)
Carbohydrate	64.67g
Protein	9.96g
Fat	14.79g
Total Sugar	18.86g
Moisture	8.49g
Ash	2.09g

Chemical properties concluded that Carbohydrate is 64.67g, the protein content is 9.96g, The Ash content 2.09g, fat content 14.79g. Energy values was found to be 431.63 Kcal as the moisture content is 8.49g, the total sugar is 18.86g respectively.

Sensory Evaluation of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

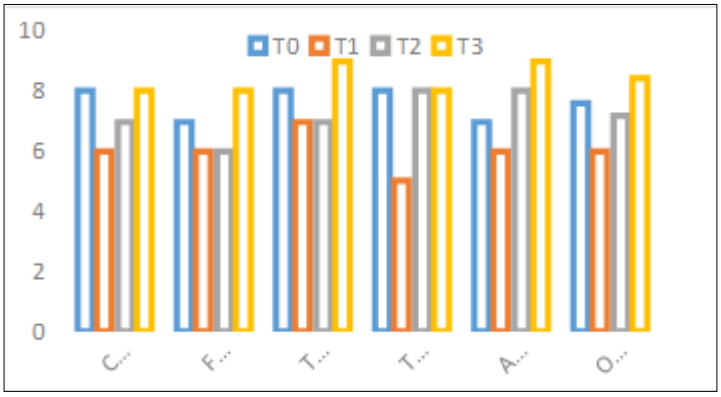

Fig 1: Table Sensory Evaluation of Ragi incorporated with Moringa oliefera Leaves Powder Crackers

Graphical representation of Ragi incorporated with Moringa oliefera Leaves Powder Crackers for Sensory Evaluation Shows that sample T3 has highest scores in all the quality attributes or a quality parameter as compared to other samples. Graphical representation of Cracker shows that sample T3 has highest scores as compared to other samples. The colour of T3 sample as per graph has 8 points while samples T0 (08), T1 (06), T2 (07). The flavour of sample T3 was acceptable with 8 points while samples T0 (07), T1 (06), T2 (06). The taste of sample T3 was selected by 9 points while other samples are T0 (08), T1 (07), T2 (07). The texture of sample T3 was selected by 8 points while other samples are T0 (8), T1 (5), T2 (8). The appearance of sample T3 was selected by 9 points while other samples are T0 (07), T1 (6), T2 (8). The overall acceptability of sample T3 was selected by 8.4 points while other samples are T0 (7.6), T1 (6), T2 (7.2).

Conclusion

In the present study finally it is concluded that Crackers prepared from different Variations such as Ragi flour, Moringa leaves powder, and other ingredients has high Nutrition quality and also they are rich in Protein, carbohydrates and some vital minerals such as calcium and iron in proper amount and has great health benefits. The present investigation carried out for information of Cracker in which T3 sample found more superior than sample T1 and T2 so, T3 sample is more acceptable on its sensory attributes.

References

1. Patel I, Patel K, Pinto S, Patel S. Ragi: A Powerhouse of Nutrients. J Dairy Sci Technol,2016:5(3):36-47.
2. Mathanghi SK, Sudha K. Functional and phytochemical properties of finger millet (*Eleusine coracana* L.) for health. Int J Pharm Chem Biol Sci,2012:2(4):431-438. ISSN: 2249-9504.
3. Desai AD, Kulkarni SS, Sahu AK, Ranveer RC, Dandge PB. Effect of supplementation of malted Ragi flour on the nutritional and sensorial quality characteristics of cake. Adv J Food Sci Technol,2010:2(1):67-71.
4. Kaur S, Mondal P. Study of total phenolic and flavonoid content, antioxidant activity and antimicrobial properties of medicinal plants. J

Microbiol Exp,2014:1(1):00005. DOI: 10.15406/jmen.2014.01.00005.
5. Chaturvedi R, Srivastava S. Genotype variations in physical, nutritional and sensory quality of popped grains of amber and dark genotypes of finger millet. J Food Sci Technol,2008:45(5):443-446.
6. Anonymous. The wealth of India. CSIR: New Delhi, 2003, 260-271.
7. Anonymous. The Wealth of India. Vol,10. CSIR: New Delhi, 2003, 267-270.
8. British Pharmacopaeia. Appendix XF A173,1998, A173.
9. British Standard Methods of the Analysis of Oils and Fats,1958. B. S. 684. British Standard Institution Incorporated by Royal Charter. British Standards House, 2 Park St, London, W. I.
10. Rastogi M, Joshi M. Effect of Ragi (*Eleusine coracana*) for the development of value-added products and their nutritional implication. Asian J Home Sci,2015:10(1):1-5.
11. Kokani RC, Hule PB, Kelgane SS. Studies on Utilization of Ragi for Preparation of Malted Ragi Cookies. Index Copernicus Value,2016.
12. Athawale GH, Thorat AD, Shukla RM. Development of finger millet and flaxseed crackers. Volume 6, Issue 2. October 2015.
13. Gavhane AR, Ghodke KD. Studies on Development of Process Technology for Preparation of Crackers Made from Amaranth Leaves. SDRP J Food Sci Technol,2019, 4(9).
14. Chandra D, Chandra S, Pallavi, Sharma AK. Review of Finger Millet: A Powerhouse of Health Benefiting Nutrients,2016.
15. Cova JK, Magata M, Zlatica K. Rheological and Qualitative characteristics of pea flour incorporated crackers biscuit. International information system for agricultural science and technology,2013.
16. Kamal M, Kalam AA, Shahanur K, Azad A. Processing and Quality Evaluation of Crackers from Cassava Flour. Int Res J Biol Sci,2016:5(1):22-25.
17. Karad VA, Jangale RS, Karad A. Quality characteristics of crackers made from kasurimethi and different flour. Int J Science,2013:5(1).
18. Khatun H, Nusarat J, Mojaffar H, Trisna M, Shahinoor R. Effect of Papaya and Storage Time on the Quality of the newly papaya develop crackers. J Exp Biol Agric Sci,2016:4(2):2320-8694.
19. Mariano G, Hercia D, Elvira G, Elvera G. Chia Seed as a Source of Protein and Bioactive Peptide with Health Benefits: A Review, 2019.
20. Mihiranie S, Mithila J, Niranjali P. Development of Snacks Cracker Incorporated with Defatted Coconut Flour. J Microbiol Biotechnol Food Sci,2017:153-159.
21. Shobana S, Krishnaswamy K, Sudha V, *Malleshi NG*, Anjana RM, Palaniappan L, Mohan V. Finger millet: A Review of its Nutritional Properties, Processing and Plausible Health Benefits. Adv Food Nutr Res,2013:69.
22. Singh P, Raghuvanshi RS. Finger millet for Food and Nutritional Security. Afr J Food Sci,2011:6(4):77-84.
23. Ventakatachalam K, Nagarajan M. Physico Chemical and Sensory Properties of Savory Crackers Incorporating Green Gram Flour to Partially or Wholly Replace Wheat Flour.
24. Zikankuba V, James A. Quinoa: A Potential Crop for Food and Nutritional Security in Tanzania. Am J Res Commun,2017:4(1):15-28.
25. Savankumar N Patel, Harshal E Patil, Raj C Popat. Genetic Diversity Study in Finger Millet (*Eleusine coracana* L.) Genotypes: A Multivariate Analysis Approach. Int J Pure App Biosci,2017:5(5):183-189.
26. Mbah BO, Eme PE, Paul AE. Effect of Drying Techniques on the Proximate and Other Nutrient Composition of *Moringa oleifera* Leaves from Two Areas in Eastern Nigeria. Pak J Nutr,2012:11(11):1044-1048. ISSN: 1680-5194.
27. Emelike NJT, Uwa FO, Ebere CO, Kiin-Kabari DB. Effect of Drying Methods on the Physico-Chemical and Sensory Properties of Cookies Fortified with *Moringa* (*Moringa oleifera*) Leaves. J Agric Food Sci,2015:03(04). ISSN: 2321-1571.
28. Supawan Bunrathep, Thanapat Songsak. Nutrients and minerals content of eleven different samples of *Moringa oleifera* cultivated in Thailand. Suchada Jongrungruangchok. J Health Res,2010:24(3):123-127.
29. Dahot MU. Vitamin contents of the flowers and seeds of *Moringa oleifera*. Pak J Biochem,1988:21(1-2):21-24.
30. Mensah JK, Ikhajiagbe B, Edema NE, Emokhor J. Phytochemical, nutritional and antibacterial properties of dried leaf powder of *Moringa oleifera* (Lam) from Edo Central Province, Nigeria. J Nat Prod Plant Resour,2012:2(1):107-112.
31. Mohammad Abu Taher, Mohammad Abu Bin Nyeem, Md. Monir Ahammed, Md. Mobarak Hossain, Mohammad Nazrul Islam. *Moringa oleifera* (*Shajna*): the wonderful indigenous medicinal plant. Asian J Med Biol Res. ISSN: 2411-4472 (Print), 2412-5571 (Online).
32. Anwar F, Latif S, Ashraf M, Gilani AH. *Moringa oleifera*: A Food Plant with Multiple Medicinal Uses. Phytother Res,2007:21:17-25. DOI: 10.1002/ptr.2023.
33. Moyo B, Masika PJ, Hugo A, Muchenje V. Nutritional characterization of *Moringa* (*Moringa oleifera* Lam.) leaves. Afr J Biotechnol,2011:10(60):12925-12933. ISSN: 1684–5315.