



Preparation and Quality Characterisation of Ragi Laddu

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ABSTRACT

Finger Millet, known as Ragi considered as essential millets develop widely in India and Africa. Its scientific is *Eleusine Coracana*. The study was framed to standardised ragi laddu and to know quality parameters. The nutritional analysis of the selected sample C ragi laddu had a Carbohydrate of 67.39g/100gms, 3.18g/100gms of Protein, 20.21g/100gms of total Fats, 8.03g/100gms of Moisture, 1.19g/100gms of Ash and 1.24g/100gms of Crude Fibre. After 15 days study the microbial analysis of ragi laddu showed acceptable range 3090 CFU/g. Ragi has excellent nutritive value makes it excellent for management of Malnutrition and a diet for Diabetes. Being densely packed with a host of nutrients, it confers valuable health benefits such as enhancing digestion, slowing down ageing, reducing risk factors of heart diseases and managing diabetes.

Keywords: Hedonic scale, jaggery, nutritive value, ragi laddu and sensory evaluation.

1. INTRODUCTION

Finger Millet or Ragi it is an most important staple food in India. Millet has an extremely nutritious source of cereals that is beneficial for good health. Moreover it has high levels of calcium that helps in strengthening bones for growing children and ageing people. Proper consumption of millets is good for bone health and prevents osteoporosis and reduces the risk of fracture. It helps in managing glucose levels in condition of diabetes. Since it has been found that ragi based diet which helps in diabetics as it contains higher fibre than wheat and rice. Whole finger millet has lower glycemic response i.e decreases the blood sugar level. Finger Millet has a good source of natural iron and its helps to prevent Anaemia.

Millet is packed with Antioxidants which help your body to fight against the free radicals to prevent cancer. As it contains phytonutrients that prevents the risk of colon cancer. Its helps in getting relief from constipation and weight management. Ragi also helps to prevent premature greying of hair. It is usually caused due to the oxidation of tissues, and the antioxidants present in ragi will effectively prevent the damage to tissues, therefore reducing the possibility of having grey hair. Ragi has high amounts of fibre that keeps your stomach full and stops craving. Ragi helps in weight control reduces the blood sugar level in your body and helps to produce insulin. (Nikita Toshi 2023).

Finger Millet is considered one of the most nutritious cereals. Finger millet contains about 5–8% protein, 1–2% ether extractives, 65–75% carbohydrates, 15–20% dietary fiber and 2.5–3.5% minerals. Of all the cereals and millets, finger millet has the highest amount of calcium (344mg %) and potassium (408mg %). The cereal has low fat content (1.3%) and contains mainly unsaturated fat. 100 grams of Finger Millet has roughly on an average of 336 KCal of energy in them. However, the millet also contains phytates (0.48%), polyphenols, tannins (0.61%), trypsin inhibitory factors, and dietary fiber, which were once considered as “anti nutrients” due to their metal chelating and enzyme inhibition activities (Thompson 1993) but nowadays they are termed as Nutraceuticals.

2. MATERIALS AND METHOD

Material Procurement

Ragi Flour, Almonds, Fox Nuts, Jaggery and Ghee as required were collected from super market in Hyderabad, India. The present study was performed in Capital Degree and PG College, Hyderabad-500055, Telangana.

Preparation of Ragi laddu

Take Finger Millets, Almonds, and Fox Nuts and kept aside. Heat ghee in a non-stick pan, add finger millet flour and cook, stirring continuously, on medium heat, till fragrant. Side by side, heat 2-3 tbsps water in another pan, add jaggery and let it melt. Take the almonds and fox nuts and grind them in to a fine powder. Add the finger millet flour in a large bowl and then add almonds and fox nuts powder and mix well. Pour the jaggery syrup and mix till

well combined. Once the temperature of this reduces slightly then grease your palms with some ghee and mix it with your hand. Take small portions of the mixture and shape them into laddu.

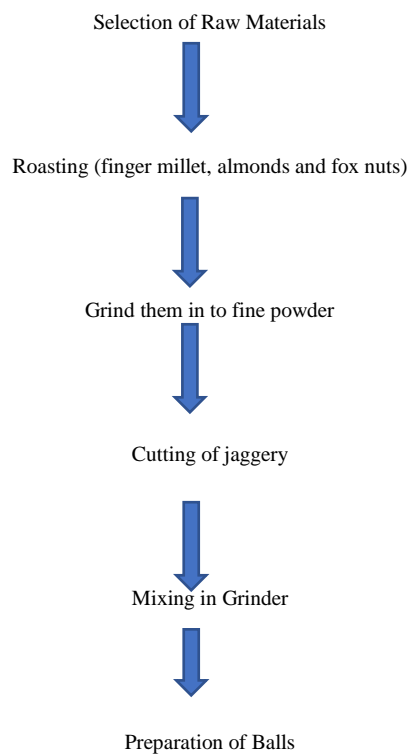
Table 1: Formulation of Laddu

Samples	Ragi Flour (g)	Jaggery (g)	Almonds (g)	Fox nuts (g)
Sample A	50 g	15 g	50 g	30 g
Sample B	40 g	15 g	25 g	30 g
Sample C	25 g	15 g	50 g	30 g



Fig 1: Ragi Laddu

Basic Procedure flow chart for preparation of Ragi Laddu



Nutritional Evaluation

Proximate analysis is a set of methods used to determine the nutritional composition of a food sample. It involves the measurement of various components such as moisture, protein, fat, carbohydrates, fiber and ash.

Table-2: The nutritional evaluation of best selected sample C was analysed as follows:

Test Parameter	Method	Units Of Measurement
Carbohydrate	IFSH/SOP/C/TE/142	g/100g
Protein	IS:7219-1973	g/100g
Moisture	AOAC:925.10 21 st Edition	g/100g
Ash	FSSAI Manual of Cereal & Cereal Products	g/100g
Fat	AOAC:922.06	g/100g
Crude Fibre	IS:10226 Part 1:1982	g/100g

Moisture Determination

The AOAC: 925.10 21st Edition is the method used to determine the amount of water present in the Ragi Laddu. The moisture determination procedure outlined in AOAC 925.10 involves sample preparation, drying, cooling and weighing. Formula to calculate is Moisture content (%) = [(Initial weight - Final weight) / Initial weight] × 100. W1 is the initial weight of the sample before drying. W2 is the weight of the sample after drying.

Ash Determination

The FSSAI (Food Safety and Standards Authority of India) Manual of Cereal & Cereal Products provides guidelines and standards for various aspects of cereal and cereal product analysis, including ash determination. This method has different steps like preparation, weighing, incineration, ashing, cooling and weighing. Calculate the ash content using the following formula: Ash content (%) = (Weight of ash / Weight of the sample) × 100

Fat Determination

The AOAC International (Association of Official Agricultural Chemists) method is AOAC 922.06, which is used for the determination of fat in food samples. The method involves weighing, extraction, and drying, Gravimetric determination. The formula for calculating the fat content using the AOAC 922.06 method is as follows: Fat (%) = (Weight of extracted fat / Weight of sample) × 100

Protein Determination

IS:7219-1973 refers to the Indian Standard (IS) specification for the determination of protein in food products. The Kjeldahl method is a widely accepted reference method for protein determination. It involves the steps like Digestion, Distillation, and Titration. The amount of nitrogen in the sample is determined from the volume of hydrochloric acid used in the titration. Proteins contain about 16% nitrogen; the protein content can be calculated by multiplying the nitrogen content by a conversion factor.

Carbohydrates Determination

Involves quantifying the total amount of carbohydrates present in a food sample, including sugars, starches, and dietary fibers. Carbohydrates and fiber can be determined by difference after subtracting the sum of moisture, ash, fat, and protein.

Fiber content

The Fiber determination method described in IS:10226 Part 1:1982 is based on the gravimetric method, which involves the sample preparation, digestion, filtration, washing. Calculate the fiber content as a percentage based on the weight of the dried Fiber residue and the weight of the original sample.

Organoleptic Evaluation

The sensory evaluation was carried out for the prepared ragi laddu using a 5-point hedonic scale with panel of 20 judges considering 6 parameters such as colour, texture, aroma, taste, appearance, overall acceptability.

Microbiological Analysis

Microbial analysis such as total plate count was carried out after 15 days of study by procedure followed by Indian Standard method.

Statistical Analysis

Data obtained from sensory analysis is subjected to mean and standard deviation and it was statistically calculated by Anova using a significance of P value 0.05.

3. RESULTS AND DISCUSSION

Sensory Evaluation

The mean and standard deviation of the sensory scores for different parameters. In terms of Colour, sample A has a mean value of 3.65 while sample B has a mean value of 3.85 and sample C has a mean value of 4.5 (Table 3). Regarding Texture, sample A has a mean value of 3.65 with a standard deviation

of 0.67; while sample B has a mean value of 3.45 and sample C has a mean value of 4.6. Further Aroma, sample A has a mean value of 3.5 with a standard deviation of 0.51, while sample B has a mean value of 3.55 and sample C has a mean value of 4.6. In terms of Taste, sample A has a mean value of 3.55 with a standard deviation of 0.51; while sample B has a mean value of 3.85 and sample C has a mean value of 4.65 with a standard deviation 0.48. For Appearance, sample A has a mean value of 3.5 with a standard deviation of 0.51, while sample B has a mean value of 3.4, and sample C has a mean value of 4.55. These measurements provide an assessment of the sensory attributes for three samples A,B and C. Sample C generally tends to have higher mean value across all attributes, indicating a potentially better sensory experience compared to sample A and B.

Table 3: Sensory Evaluation of Ragi Laddu

Sample	Colour	Texture	Aroma	Taste	Appearance	Overall acceptability
Sample-1	3.5	4.5	4.5	4	4.5	4.5
Sample-2	4.5	3.5	3.5	4.5	4.5	4.5
Sample-3	4.5	4.5	3.5	4.5	4	4.5

Table-4: ANOVA test for sensory evaluation of Different samples of Ragi Laddu

Source of variation	SS	Df	MS	F	P-Value	F crit
Between Groups	3.3373333	2	1.6686667	104.2917	2.592E-08	3.885293835
Within Groups	0.192	12	0.016			
Total	3.5293333					

Nutritional Analysis of Ragi Laddu

The nutritional analysis of the selected sample C ragi laddu had a Carbohydrate of 67.39g/100gms, 3.18g/100gms of Protein, 20.21g/100gms of total Fats, 8.03g/100gms of Moisture, 1.19g/100gms of Ash and 1.24g/100gms of Crude Fibre (Table 5). According to Puri Avadhut P et al (2022) the carbohydrate content present in Ragi Laddu were 67.4g/100grams, protein content of 10.5g/100grams, moisture content of 9.2g/100grams, Fat content of 10.5g/100grams, Ash content of 1.8g/100grams.

Table-5: Nutritive Value of Ragi Laddu.

Test parameter	Results	Units of Measurement
carbohydrates	67.39	g/100g
Protein	3.18	g/100g
Moisture	8.03	g/100g
Ash	1.19	g/100g
Fat	20.21	g/100g
Crude Fibre	1.24	g/100g

Microbiological Parameters of Ragi Laddu After 15 Days Storage

As shown in table 6, the parameter listed is the total plate count, which is measured in colony forming units per grams (cfu/grm). Microbial parameter for the test parameter result is 3090 Cfu/grm.

Table 6: Microbiological Parameter

S.no	Test parameter	Units of Measurements	Results
1	Total plate count	Cfu/grm	3090

4. CONCLUSION

From the present investigation, It was concluded that the ragi balls prepared with almonds and fox nuts was found to be organoleptically accepted as compare to the other samples. The scores of standard were more acceptable than all the variations made at different concentrations. It was also observed that the concentration of almonds, fox nuts and the ragi was inversely proportional to the acceptability scores. In sample C was accepted by the people. Amongst the incorporated food preparation, the mean scores for overall acceptability were highest for sample C and lowest for sample A and B.

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