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Development and formulation of Ragi balls Enriched with Peanuts and Dates

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Abstract

Ragi ball is one of the most popularised traditional and healthy foods in India. Using ragi, jaggery, peanuts, dates and coconut powder at different combinations developed ragi ball. Totally four samples variations were formulated *viz*. Control sample, sample A, sample B and sample C for the study. The time taken to prepare balls ranged from 30-50. Sensory evaluation was done for the control sample and for all the four variations to know the most acceptable mixes from each of the sample. Chemical and nutritional properties were evaluated for control sample and for the all sample with control sample. The sample C was accepted and also higher percent nutritional properties as compared to other sample. Nutritional value of sample C of ragi balls the moisture content of control sample was 9.2 percent, fat content 10.5 percent, protein content 10.5 percent, carbohydrate content 67.45 percent, ash content 1.8 percent and energy value was obtained 405.9 Kcal/100gm.

Keywords: Ragi millet, Peanuts, jaggery, Date, Ragi balls

Introduction

A millet crop includes grasses like finger millet, (*Eleusine coracana* (L.) Gaertn), pearl millet (*Pennisetum glaucm* (L.) R.Br), foxtail millet (*Setaria italica* (L.) P. Beauvois), kodo millet (*Paspalum scorbiculatum* L.), bahiagrass (*Paspalum nota- tum* Flugge), little millet (*Panicum sumatrense* Roth ex Roem. & Schult.), proso millet (*Panicum miliaceum* L.), barnyard millet (*Echinochola crusgalli* (L.) P. Beauv), guinea grass (*Pan- icum maximum* Jacq), elephant grass (*Pennisetum purpurium* Schumach.) that belong to the family Poaceae of the mono- cotyledon group (Chandra *et al.*, 2014). Finger millet commonly known as ragi and mandua in India is one of the minor cereals a native of Ethiopia, but grown exten- sively in various regions of India and Africa, constitutes as a staple food that supply a major portion of calories and protein to large segments of the population in these countries especially for people of low income groups (Kennedy *et al.*, 2006) ^[7]. In India, finger millet occupies the largest area under cultivation among the small millets. Finger millet stands unique among the cereals such as barley, rye and oats with higher nutritional contents and has outstanding properties as a subsistence food crop (Chandra *et al.*, 2014).

Finger millet is especially valuable as it contains the amino acid methionine, which is lacking in the diets of hundreds of millions of the poor who live on starchy staples such as cassava, plantain, polished rice, or maize meal (Dissanayake *et al.*, 2016)^[3]. Ragi is considered to be a coarse grain as compared to rice because of its fibrous seed coat. It being unique among cereals, *Ragi* is very rich source of calcium containing 0-3 to 0.4 g as compared to other minerals like phosphorus, iron, magnesium and fiber. Its protein is relatively better balanced because *Ragi* contains more enzymes like lysine, threonine and valin then other millets (Ravindran, 1991)^[13].

The nutraceutical importance of finger millet lies in its high content of calcium (0.38%), protein (6%–13%), dietary fiber (18%), carbohydrates (65%–75%), minerals (2.5%–3.5%), phyates (0.48%), tannins (0.61%), phenolic compounds (0.3–3%) and trypsin inhibitory factors, and is recognized for its health beneficial effects, such as anti-diabetic, antitumerogenic, anti-diarrheal, antiulcer, anti-inflammatory, atherosclerogenic effects, antioxidant and antimicrobial properties (Devi *et al.*, 2014) ^[2]. *Ragi* is usually converted to flour and variety of the cheela, ladoo, and salty porridge. Traditionally used for preparation of flour, pudding, porridge and roti. With the change in scenario of utilization of processed products and awareness of the consumers about the health benefits, finger millet has gained importance because of its functional components such as slowly digestible starch and resistant starch. The composite flour of ragi and wheat appears not only to improve the nutritional quality but promote the health benefits (Muktar *et al.*, 2018)^[16].

Date palm (*Phoenix dactylifera* L.) is an important fruit for the populations living in the Algerian Sahara. It is a vital compo- nent of their diet. These fruits are rich in simple sugars like glucose and fructose (65–80%), and represent a good source of fibers (6.4–11.5%) as well as some essential minerals (0.10–916 mg/ 100 g dry weight) (Benmeddour *et al.*, 2013)^[19].

Date fruits have enormous scope and potential for use as food be- cause of their nutritional and economical value. Date fruits contain 6.5–11.5% total dietary fibers (of which 84– 94% insoluble and 6–16% soluble dietary fiber), about 1% fat, 2% proteins, and 2% ash and is a rich source of phenolic antioxidants (1–2%) (Ghnimi *et al.*,2017) ^[14]. Dates have less fat content, hence heart patients can consume dates as such or their products (Panda, 2001) ^[11]. The date is a sweet edible fruit. The fruit is a drupe in which an outer fleshy part consists of pulp and pericarp surround a shell (the pit of stone) of hard endocarp with a seed inside (Ahmed *et al.*, 1995)

Peanuts (Arachis hypogaea L.) are among the major oilseeds in the world. Peanuts are often a major ingredient in mixed nuts because of their inexpensiveness compared to cashews and walnuts. India is one of the major contributors of peanuts produce to the world as India is the world's second largest producer after China (Bansal et al., 2013)^[12]. Peanut flour is made from crushed, partly defatted peanuts and is very low in saturated fat and cholesterol. It is also a good source of dietary fiber, thiamin, folate, potassium and zinc, and a very good source of protein, niacin, magnesium, phosphorus, copper and manganese (Fekria et al., 2012)^[5]. Peanut flour, which is most commonly used for fortification, contains protein ranging in between 47% - 55% i.e. a good amount of protein. Peanut flour has been used to replace animal proteins in a variety of products. Peanut flour blends well with cereal flour to yield products with excellent flavor texture and color (Bansal et al., 2013)^[12].

Jaggery commonly known as Gur in India, Desi in Pakistan, Panela in Mexico and South America, Jaggery in Burma and African countries, Hakuru in Sri Lanka and Naam Taan Oi in Thailand. Jaggery is also termed as "Gur" in North India and "vellum" or "bellam" in South India. By definition, Jaggery is the natural sweetener obtained on concentrating the sweet juices of sugarcane with or without prior purification of juice and without use of any chemical/ synthetic additives or preservatives, into a solid or semi- solid state. Although labeled as the poor man's sugar, most Indians consume Gur in some form or the other. Of these, jaggery is considered as a food material, as it contains a large quantity of minerals in addition to energy and is consumed directly as sweetener, and also in different preparations including animal feed mixtures (Singh, 2011) ^[17]. Gur is high calorie sweetener and as it contains minerals, protein, glucose and fructose, it is known to be healthier in comparison to white sugar. A good quality Gur contains more than 70% sucrose, less than 10% of glucose and fructose, less than 5% minerals and less than 3% moisture (Nath et al., 2015)^[10].

Coconut (*Cocos nucifera*) is one of the most important crops in tropical areas. It is usually referred as 'tree of heaven' or '*kalpavriksha*' because it provides more useful and diverse product to the people (Sangamithra *et al.*, 2013)^[15]. Coconut flour can provide not only value added income to the industry, but also a nutritious and healthy source of dietary fiber (Trinidad *et al.*, 2001)^[18] Coconut flour may play a role in controlling cholesterol and sugar levels in blood and prevention of colon cancer. Studies revealed that consumption of high fiber coconut flour increases fecal bulk (Arancon, 1999)^[1].

Material and Method

Ragi Balls is one of the sweet product prepared by mixing of roasted ragi flour with roasted groundnuts, dates and jaggery as a sweetener. The Ragi Balls are prepared from groundnuts, dates, jaggery and ragi flour by Grinding and mixing. The sample prepared using the coating of coconut powder. Ingredient of Ragi Balls: -

- 1. Ragi
- 2. Dates
- 3. Peanuts
- 4. Jaggery
- 5. Coconut Powder

Development and formulation of Ragi Balls

Preliminary studies were performed for the purpose of identifying the appropriate proportions of ingredients, sample combination, cooking and accordingly percentage of supplementation was established through sensory evaluation, selected samples was studied for further process and analysis.

Table 1: Formulation of ragi balls

Sample	Ragi	Jaggery	Peanuts	Dates	Coconut powder
Control	35	35		20	10
Sample A	25	20	25	15	15
Sample B	20	20	20	25	15
Sample C	25	25	15	20	15

Control – Ragi: jaggery: dates: coconut powder (35:35:20:10) Sample A- Ragi: jaggery: Peanuts: dates: coconut powder (25:20:25:15:15)

Sample B- Ragi: jaggery: Peanuts: dates: coconut powder (20:20:20:25:15)

Sample C- Ragi: jaggery: Peanuts: dates: coconut powder (25:25:15:20:15)

Preparation of Ragi ragi enriched balls

Dry roast all ingredients for few minutes on hot pan except and then let them cool down. Once they are cool, transfer in a blender and grind them to make fine powder.



Fig 1: Process Flowchart of Ragi Ball

Result and Discussion

A number of trials were conducted by taking varying combinations of ragi, jaggery, peanuts, dates and coconut powder. Accordingly, ragi ball was prepared with 20-35 percent ragi, 20-35 percent jaggery, 15-25 percent peanuts, 15-25 percent dates and 10-15 present coconut powders. The control ragi ball was prepared with ragi (35%), jaggery (35%), dates (20%) and coconut powder (10%). In the primary sensory evaluation test, different ragi ball were prepared from different formulations and were evaluated by panelists.

Sensory evaluation of ragi balls

The sensory quality characteristics of the ragi balls prepared from various ingredients were evaluated by panel of 15 trained judges using nine-point hedonic scale (1-dislike extremely, 2-dislike very much, 3-dislike moderately, 4dislike slightly, 5-neither like nor dislike, 6-like slightly, 7like moderately, 8-like very much and 9-like extremely). The samples were identified by code number to the panelists.

Sensory evaluation of ragi balls prepared from different formulations of ragi balls presented in table 2.

Table 2. School v Cyardanon of fagi ban	Table 2:	Sensorv	evaluation	of ragi	balls
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Sample	Appearance and Colour	Taste	Texture	Flavor	Overall acceptability
Control	8	9	9	9	8.7
Sample A	8	7	7	8	7.5
Sample B	8	8	7	8	7.7
Sample C	9	8	9	8	8.5



Fig 2: Sensory evaluation of ragi balls

Proximate Analysis of ragi balls

Proximate analysis of ragi balls presented in table no 3 it showed that the control sample of ragi balls the moisture content of control sample was 9.01 percent, fat content 8.11 percent, protein content 8.0 percent, carbohydrate content 65.39 percent, ash content 1.2 percent and energy value was obtained 366.5 Kcal/100gm. The different formulation of ragi proximate composition was obtained moisture content of sample A, B, C was 9.8, 10.1, 9.2 percent respectively. The fat content of sample A, B, C was 9.12, 10.1,10.5 percent

respectively. The protein content of sample A, B, C was 9.7, 9.9, 10.5 percent respectively. Carbohydrate content of sample A, B, C was 65.9, 66.6, 67.45 percent respectively. Ash content of sample A, B, C was 1.6, 1.3,1.8 percent respectively and the energy value obtained from sample A, B, C was 384.4, 396.9 405.9 Kcal/ 100gm respectively. The chemical and nutritional properties of instant ragi ball mixes moisture content, fat content, protein content, carbohydrate content and ash content was 8.24, 1.09, 8.69,72.47,0.96 respectively (Priya *et al.*, 2018)^[18].

Table 3: Proximate Analysis of ragi balls

Sampla	Moisture Content	Fat Content	Protein Content	Carbohydrate Content	Ash Content	Energy Value
Sample	(%)	(%)	(%)	(%)	(%)	(Kcal/100gm)
Control	9.01	8.11	8.0	65.39	1.2	366.5
Α	9.8	9.12	9.7	65.9	1.6	384.4
В	10.1	10.1	9.9	66.6	1.3	396.9
С	9.2	10.5	10.5	67.45	1.8	405.9



Fig 3: Proximate Analysis of ragi balls



Fig 4: Energy Value (Kcal/100gm)

Conclusion

From the present investigation, it was concluded that the ragi balls prepared with peanuts was found to be organoleptically accepted as compare to the control sample which is not present peanuts. Also, the using peanuts all-nutritional properties are increases as compared to control sample. The sample C was accepted and also higher percent nutritional properties as compared to other sample.

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