

Formulation of Makhana (*Euryale ferox*) and Ragi (*Eleusine coracana*) Supplemented Nutri Cookies Incorporated with Dates Powder

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ABSTRACT

Bakery products are gaining popularity day by day. Among all bakery products cookies have high consumer acceptance. wheat flour is commonly used for making cookies whose nutritive value is comparatively low, whereas consumer demands for the nutritionally enriched products. Keeping these facts in view, the present investigation is carried out to formulate high protein and fiber cookies enriched with dates powder in two variations of makhana powder, ragi flour and wheat flour that is T₁ and T₂. From these formulation T₁ (30:10:10) is selected according to 10 panellist members by using 9 point hedonic scale. It was found that organoleptic evaluation of variation T₁ had scored highest in color, flavor, texture, taste, appearance and the overall acceptability. Also it has maximum nutritional composition such as it has high in protein that is 28.93, high in fiber content 8.1, high in CHO 32.76. Less amount of calcium and iron also found in cookies. As makhana is good source of protein, ragi is good source of calcium and iron and also help to control blood sugar level. Thus it may be conclude that good quality and nutritious cookies prepared by using makhana and ragi flour with addition of dates powder, helps to improve nutritional status of consumer.

Key Words : Bakery Product, Consumer Demand, Protein, Sensory Analysis, Fibre Rich, Nutritional Status

INTRODUCTION

The bakery product occupying important place in food industry. The annual growth of bakery industry is about 10% and demand for bakery product is increasing day by day among all section of people. Bread, cookies and biscuits are major part of bakery industry and covers around 80% of total bakery product in India (Goswami *et al.*, 2020). A cookie is a baked or cooked snack or dessert that is typically small, flat and sweet. It usually contains flour, sugar, egg, and some type of oil, fat, or butter. Cookies have been reported to be one of the most consumed confectionery products in the world. Makhana or Fox Nut (*Euryale Ferox*) is a kind of hydrophyte used both as a drug and food which exhibits much application and development prospect in the fields of medicine, food,

and economy. Makhana is the seed of a cash aquatic crop, which was popularly used as herb and food in China. Makhana possessed high nutritional value and many medical and health protection effects. Lower grades of makhana can be converted into powder or flour form and sold for preparation of bakery or other products (Kumar *et al.*, 2015; Arya *et al.*, 2017, Rathod *et al.*, 2023). Popped makhana flour may possibly serve as a useful alternative in nutritious food products and could improve the physio-chemical, functional and sensory characteristics of products. Replacement of part of wheat flour with non-wheat ingredients such as barley, sorghum, millet, oatmeal, and multi-grain mixtures for the production of cookies and baked products had been reported by various researchers (Sammy *et al.*, 1970; Kapoor *et al.*, 2023; Biradar *et al.*, 2021; Singh and Shekhawat, 2020).

It is regarded as a superfood because of its numerous health advantages, including cardioprotective, anti-diabetic, antioxidant, and anti-fatigue properties. Ragi is important millet crop in dry hill area of India. It is rich in protein, calcium, phosphorus, iron, fibre, and vitamin content. The calcium content is higher than all cereals and iodine content is highest among all the food grains. As we have seen Ragi is rich in calcium and iron other than all food grains. Deficiency of ragi leads to malnutrition so, by giving Ragi as a supplementary source we can combat the deficiency of Calcium and Iron among school children. It helps to control blood sugar level, it acts as a natural treatment for multiple diseases like anemia, diabetes, brittle bones, and osteoporosis. Dates are rich in nutrients such as protein, iron, calcium and phosphorus. They provide a good source of rapid energy due to their high carbohydrate content of approximately 70-80%. Incorporating date powder into baked goods has been tried previously with promising results (Alsenaien *et al.*, 2015; Kapoor *et al.*, 2023) Such incorporation would not only improve the nutritional value of the produced cookies, for instance, by enhancing dietary fibre content and antioxidant properties, At the same time, baked food items such as cookies, biscuits, muffins, and cakes are very popular among consumers due to their taste and availability. A key component of chapatti, bread, and bakery goods including cakes, cookies, crackers, doughnuts, sweet rolls, biscuits, and so forth is wheat flour. Because wheat flour has the innate ability to make dough and hold onto gasses, it is a fundamental ingredient in bread goods. The research aims to uncover ways to make foxtail more accepted not only as a traditional processed food, but also as a value-added product, by exploring the possibility of improving the use of foxtail as an important food. Consequently, the aim of this study was to determine how the incorporation of foxnut flour into biscuits affects their proximate, physical properties, mineral, amino acid content.

METHODOLOGY

The present research was carried out in the department of quality lab at TGB bakers, Ahmedabad, India.

Materials:

Raw materials and ingredients:

Popped makhana, Ragi flour, wheat flour, sugar, dates powder, milk, butter, baking powder, baking soda,

pistachios, etc. these all were brought from local market.

Chemicals:

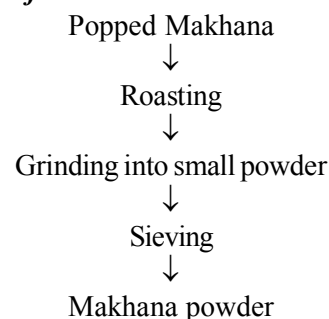
Chemicals of analytical grades were made available in the laboratories of department of analytical lab at industry.

Processing Equipment:

The analytical equipment like hot air oven, kjeldahl, muffle furnace, moisture meter, were made available in the laboratories of department of analytical lab in the industry.

Methods:

Formulation of Makhana Powder:



Formulation of Cookies:

Two different formulation of cookies are made coded as T₁ and T₂ prepared according to composition given in Table 1.

Table 1 : Different formulation of cookies

Sr. No.	Ingredients	Treatments	
		T ₁	T ₂
1.	Makhana powder (g)	30	20
2.	Ragi flour (g)	10	20
3.	Wheat flour (g)	10	10
4.	Dates powder (g)	10	10
5.	Sugar (g)	7	7
6.	Butter (g)	25	25
7.	Baking powder (g)	1	1
8.	Baking soda (g)	0.5	0.5
9.	Milk (ml)	7	7
10.	Pistachios (g)	1	1

Preparation of Cookies:

Makhana and Ragi supplemented nutri Cookies were prepared as per procedure given in Fig. 1. The popped makhana is grinded and sieved before using it. The butter was beaten along with powdered sugar, then the mixture

of Makhana flour, ragi flour, wheat flour, dates powder, baking powder, baking soda was added and knead the mixture with addition of milk until get the desired consistency dough. The sheet were formed ,it was then moulded and place on the baking trays and allow to bake at 180°C for 25 min. after baking the trays were taken out, cooled and cookies were packed.

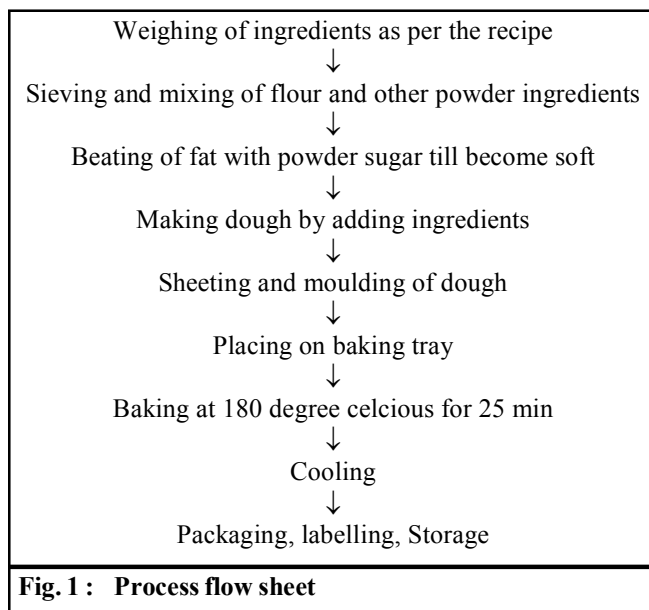


Fig. 1 : Process flow sheet

Proximate Analysis of Cookies:

Moisture content, protein content, fat content, ash content, total carbohydrate content, total energy was determined using procedures. The moisture content was determine using hot air oven method, Protein content was determine using the kjeldhal method, Fat is estimated by AOAC 950.54, and Ash content is determined by muffle furnace while Carbohydrate was by the difference method. Iron and calcium content was determined using standard method mentioned in Ranganna (2009).

Determination of Moisture content:

A small amount of the crushed prepared cookie sample was kept in a pre-weighed glass petri-dish and dried in hot air oven at 130°C for 4 hours. Then the loss in weight was calculated as the percentage of moisture content (MC) of a sample.

$$MC (\%) = \frac{W_2 - W_1}{2W} \times 100$$

Where, W= weight of the sample, a W_1 = weight of sample along with dish after heating and W_2 = weight of

sample along with dish before heating.

Determination of Ash content:

The samples were weighed before and after burning at 600° for 4-6 hours and the loss in weight were calculated as a percentage of the ash content of sample.

$$\text{Ash } (\%) = x = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

Determination of protein content:

Protein estimation was done in kjeldhal digestion flask, with the Kjeldhal method given by AOAC (1980).

Determination of fiber content ;

Digest the fat-free sample in the H_2SO_4 and NaOH by 30 minutes washing each and allow the residue to dry at 105°C overnight and final residue was burnt at 600°C for 4 hours, The amount of fiber can be calculated as

$$\text{Crude fiber} = \frac{(W_2 - W_1) - (W_3 - W_1)}{W} \times 100$$

where, W= weight of the sample, the W_1 = weight of empty crucible, W_2 = weight of sample + weight of empty crucible and W_3 = weight of the sample after ignition+ weight of empty crucible.

Determination of Fat content:

Dissolve sample in an organic solvent (petroleum ether) and make the double extraction so that maximum amount of fat can be extracted by removal of organic solvent at 60°C in the oven. The final calculation of fat was done by the help of a formula as:

$$\text{FAT } (\%) = \frac{\text{Weight of extracted fat}}{\text{Weight of sample}} \times 100$$

Determination of Carbohydrate content:

The FDA requires that food manufacturers calculate total carbohydrates in their food with the following formula:

$$\text{Total Carbohydrates} = \text{Total Weight of Food Serving} - (\text{Weight of Crude Protein} + \text{Weight of Total Fat} + \text{Weight of Moisture} + \text{Weight of Ash}).$$

Analysis of Iron content:

Sample was weighed and turned into ash. 2.0M HCL, 0.1M KSCN that is potassium thiocyanate was

added and sample ash was washed and mixed well. Absorbance was taken at 458nm.

Analysis of Calcium:

Preparation of the standard solution (EDTA, sodium hydroxide, dilute HCl solution and dilute NaOH solution) and reagents (buffer solution, standard calcium solution) were prepared in the fixed proportions.

Sample titration: Sample was taken in the diluted form and add a buffer to maintain pH (approx 10). A pinch of erichrome black T (till red color appeared) and titrated with EDTA (till blue color appeared).

Sensory Evaluation of Cookies :

The recipe was finalized on the basis of sensory evaluation. Sensory evaluation was carried out by 10 semi trained panellist members by using 9 point hedonic scale as per procedure given by Ranganna (2009).

RESULTS AND DISCUSSION

Proximate Analysis of Prepared Cookies:

Proximate analysis of selected T₁ formulated cookies showed the following result as per the Table 2. The moisture content of cookies was 2.51 %, the protein content was 28.93%, the carbohydrate content was found was 32.76%, total fibre content was 8.12%, total fat content was 33.15%, and total ash content was 2.48%. Total energy found was 540.1 kcal/100 g. among the minerals iron and calcium content was 5.5 and 74 mg per 100 gram of product, respectively. The data shows that supplementation of Ragi (10g) and makhana (30g) resulted in increase the protein content and minerals like calcium and iron.

Sr. No.	Parameter	Results
1.	Protein	29.93
2.	Carbohydrate	32.76
3.	Fats	33.15
4.	Moisture	2.51
5.	Fiber	8.12
6.	Ash	2.48
7.	Calcium (mg)	74
8.	Iron (mg)	5.5

Sensory Evaluation of Cookies

Sensory evaluation of prepared cookies was done by 9 point hedonic scale, 10 semi trained panel members were employed for this sensory evaluation. The product was evaluated on the basis of colour, taste, texture, flavour, appearance and overall acceptability. According to result among two different formulation the maximum overall acceptability score was found in the first variation that is T₁ 8.2 where T₂ had 7.2 which might be due to increase in Ragi flour content. Obtained result shows that ratio of 30 % Makhana flour, 10 % Ragi flour and 10 % wheat flour found to be more acceptable (Table 3, Fig. 2 and 3).

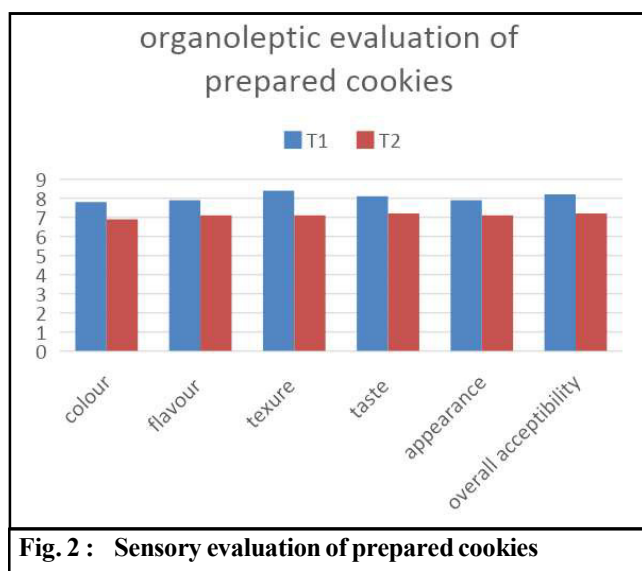


Fig. 2 : Sensory evaluation of prepared cookies



Fig. 3 : Makhana and Ragi supplemented Nutri Cookies with Dates Powder (T₁)

Sample	Color	Taste	Flavor	Appearance	Texture	Overall acceptability
T ₁	7.8	8.1	7.9	7.9	8.4	8.2
T ₂	6.9	7.2	7.1	7.2	7.1	7.2

Conclusion:

The result of the study indicates that, Nutri cookies were formulated by combination of makhana powder, Ragi flour and wheat flour with dates powder in the ratio 30:10:10 was more acceptable in all format such as in sensory evaluation and in physio chemical properties. It can be conclude that 30 % makhana and 10% Ragi can be successfully incorporated in the refined wheat flour to yield cookies with acceptable sensory attributes. As Makhana is rich source of protein, Ragi is good source of iron and calcium, it helps to control blood sugar level in body, and their utilization improves the nutritional status of consumer.

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