

DEVELOPMENT AND EVALUATION OF RICE COOKIES

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Abstract

Rice (Oryza sativa) is the staple food for nearly 60% of the world population and majority of South Indians. It is a major agricultural and economic product as it is consumed by people throughout lifespan. Diverse varieties of rice are available in the market which differs from one another in physicochemical, nutritional and cooking properties. In this study cookies are developed using less familiar varieties of rice that are locally available. Variations in cookies were developed using Brown Rice, Njavara Rice and Burma Black rice. Cookies made with White Rice flour was used as control. Sensory evaluation of rice cookies was done using 9 point hedonic scale and food action rating scale (FACT). Descriptive and inferential statistical analysis showed that cookies made with Brown rice flour was closest to the control and found most acceptable. Proximate analysis was done on the best accepted variation i.e., Brown rice cookies. It provides 397.18 kcals of energy, 60.30g of carbohydrates, 10.97 g of protein, 17.38 g of fat and 0.07 g of total fibre per 100g of the sample. This study is an attempt at incorporating less familiar varieties of rice in popular recipes thereby enriching the diets and providing a choice of snack for people with gluten sensitivity.

Keywords: brown rice, njavara rice, burma black rice, sensory evaluation, shelf life, proximate composition.

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1. INTRODUCTION

Rice is considered as life by more than half of the world population. Rice being our staple food provides bulk dietary calories to us. The journey of rice not only took root but also stayed. In the subcontinent of India a lot of prominence is given to rice cultivation as it plays a vital role in its daily meal consumption. Rice is treated with dignity in Asia and subcontinents of India, failure in the production of rice crop not only creates a recession but also fosters a famine like situation. The superstitions about the grain being plentiful in these societies, wastage of it is regarded reprehensibly.

It has been outlined that approximately 120,000 marked rice varieties are grown by various countries. Worldwide, two major rice varieties are grown today: *Oryza sativa indica* and *Oryza sativa japonica*. Cultivated rice plant grows annually to a height of a half meter to two meters but there are few varieties that grow much taller (6-9 metres). Once pollination and fertilization is complete the rice grain develops. The dehusked rice grain is known as brown rice as brownish pericarp

covers it. The pericarp is the outermost layer which envelopes the caryopsis and is removed when rice is milled and polished. Firstly rice is consumed in its white grain form which is obtained on polishing also termed as "bleaching". Regrettably, the polished white grain would have lost a lot of nutritious components on account of removal of the bran. The bran portion of the grain is a rich source of lipids, protein, soluble and insoluble dietary fibers, iron, B complex vitamins, and a number of small molecules (e.g., phytosterols, phenolic acids, and antioxidants.) Studies have shown that brown rice and rice bran has brought about a decrease in risk of developing type 2 diabetes, regulation of lipid metabolism, controlling metabolic syndrome, cardiovascular diseases and exhibiting anti-cancer activity. Ready to eat products such as popped and puffed rice, instant or rice flakes, canned rice are produced using rice. Cookie alternatively called as biscuit is a leavened product which has been made from centuries and is available for consumption in the market. Cookies are the perfect snacking option as they are agreeable, palatable, commercial and can be used as a vehicle to improve nutrient density. Due to its

less moisture content cookies can also be preserved for a longer time preventing it from microbial spoilage. Rice bran which is rich in protein can be used in making biscuits and oil can be extracted out of it which can be used as cooking oil. Rice is consumed by the individuals throughout lifespan. The diversities of rice available in our market has an upper hand in its nutritional composition which serve therapeutic benefits and also is a safer option for people with gluten sensitivity. An attempt has been made in this study to develop and evaluate rice cookies prepared using selected rice varieties.

2. MATERIALS AND METHODS

Raw Materials

White rice, brown rice, Njavara red rice, black rice were the rice varieties used in developing the variations of rice cookies. Other raw materials included were milk powder, sugar, egg, rice bran oil, almond flour, dates, baking Flour, cinnamon. All ingredients other than rice varieties were same for basic and variations. Njavara red rice, Burma Black rice varieties were procured from Amazon online shopping respectively whereas the Brown rice variety along with other raw materials were procured from the local shop in Uttarahalli, Bangalore. The procured raw rice varieties were subjected to milling in a flour Mill.

Evaluation Of Developed Products

The developed products were evaluated using 9 point Hedonic scale and FACT Scale. The best variations were studied for Proximate composition and Shelf Life.

Sensory Evaluation

A) Hedonic Scale

Sensory evaluation was done to find the acceptability of the products using 9 point hedonic scale (Peryam, DR and Pilgrim FJ 1957). Various characteristics like appearance, colour, texture, taste, odour, flavour and overall acceptability were scored from a rating 9 to 1 for all variations. This was evaluated by twenty five semi trained panellists from the

department of Food and Nutrition, Smt. VHD Central Institute of Home Science, Bengaluru.

B) FACT Scale

The variation which was best rated using 9 point Hedonic Scale was further subjected to rating using Food Action Rating Scale (Schutz, 1965) for measuring the psychological food acceptance of the highest scored variation. This was evaluated by twenty five semi trained panellists.

Proximate Composition

Protein, Fat, Fibre, Ash and Moisture % of the products was analysed through IS 7874 (Part - 1) test method ,Carbohydrate % was obtained by IS 1656 test method, Energy in kcals was obtained by Physico-Chemical method. This was conducted at Ramaiah Advanced Testing lab, Bangalore.

Shelf life Study

Shelf life studies were conducted at room temperature for a duration of 15 days for cookies.

Packaging And Labelling

Food graded plastic box was used as packaging material. It is resistant to air, humidity, therefore prevented degradation of the product. Labelling was done on the packaging material based on findings from Proximate analysis and Shelf Life study.

Costing

The cost price of each and every ingredient involved in making the product was tabulated and calculated which was inclusive of the cost of packaging and labelling. Once the total cost price of the product was obtained it was multiplied 2.5 times to obtain the selling price.

Statistical Interpretation

Descriptive and inferential statistical analysis has been carried out in the present study. The results were analysed by using SPSS version 18 (IBM Corporation, SPSS Inc., Chicago, IL, USA). Microsoft word and Excel was used to generate tables. Results on continuous

measurements were presented on Mean \pm SD (Min-Max). Significance was assessed at 5 % level of significance. One way ANOVA was applied to check the overall difference between the groups. Least Significant Difference (LSD) post hoc test was applied to check pair-wise difference between the groups.

3. RESULTS AND DISCUSSION

Developed rice cookies

Rice cookies were developed in three variations excluding the basic. Basic was made using milled white rice flour, variation-1 was made using milled brown rice flour, variation-2 using milled Njavara red rice flour and variation-3 using milled burma black rice flour (figure 1 and 2).

The rice varieties were subjected to milling before being used in developing the cookies. All the ingredients were weighed accurately prior to the preparation. Egg and vanilla essence was beaten in a mixer. Sugar, almonds and dehusked cardamom were powdered in the mixer separately.

Dates were chopped into tinier pieces using a knife. All the other ingredients previously weighed were all put together in a container and mixed.

This mixture was further kneaded into a dough and placed aside for 20 minutes. Small balls of the dough was made, flattened and then moulded into uniform shape and size using a cookie cutter. The baking tray was greased with rice bran oil and the cut cookies were arranged on the tray for baking.

Further in the pre heated oven the tray with cookies was placed and baked for 15 minutes at 180 °C. After baking the cookies were allowed to cool before storing it in a airtight container.

Evaluation Of The Developed Rice Cookies Sensory Evaluation Of Rice Cookies

A) Hedonic Scale

One Way ANOVA (Analysis Of Variance)

At 5 % Level of significance there was a significant difference between the mean judge responses for appearance, colour, and overall acceptability with F value = 4.110, 6.202, 2.955 and the p - value = 0.009, 0.001, 0.036 respectively. While other parameters were statistically insignificant. Mean value for all the parameters seen in Variation 1 was closest to the Basic i.e., Control comparing it with any other variations.

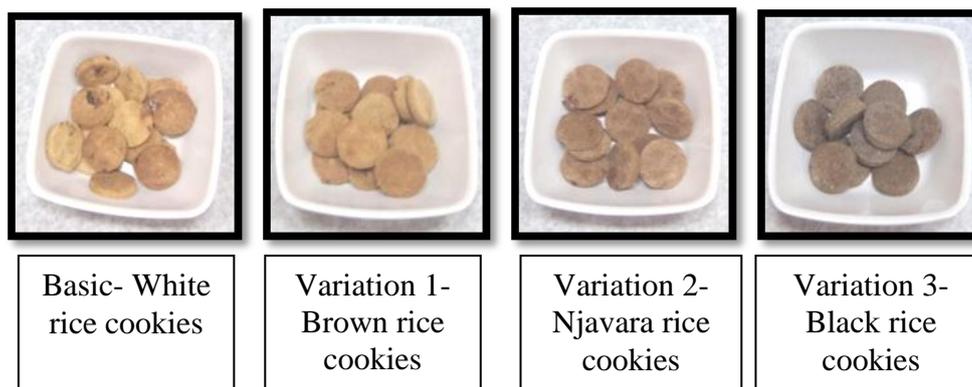


Fig. 1. Developed rice cookies variations

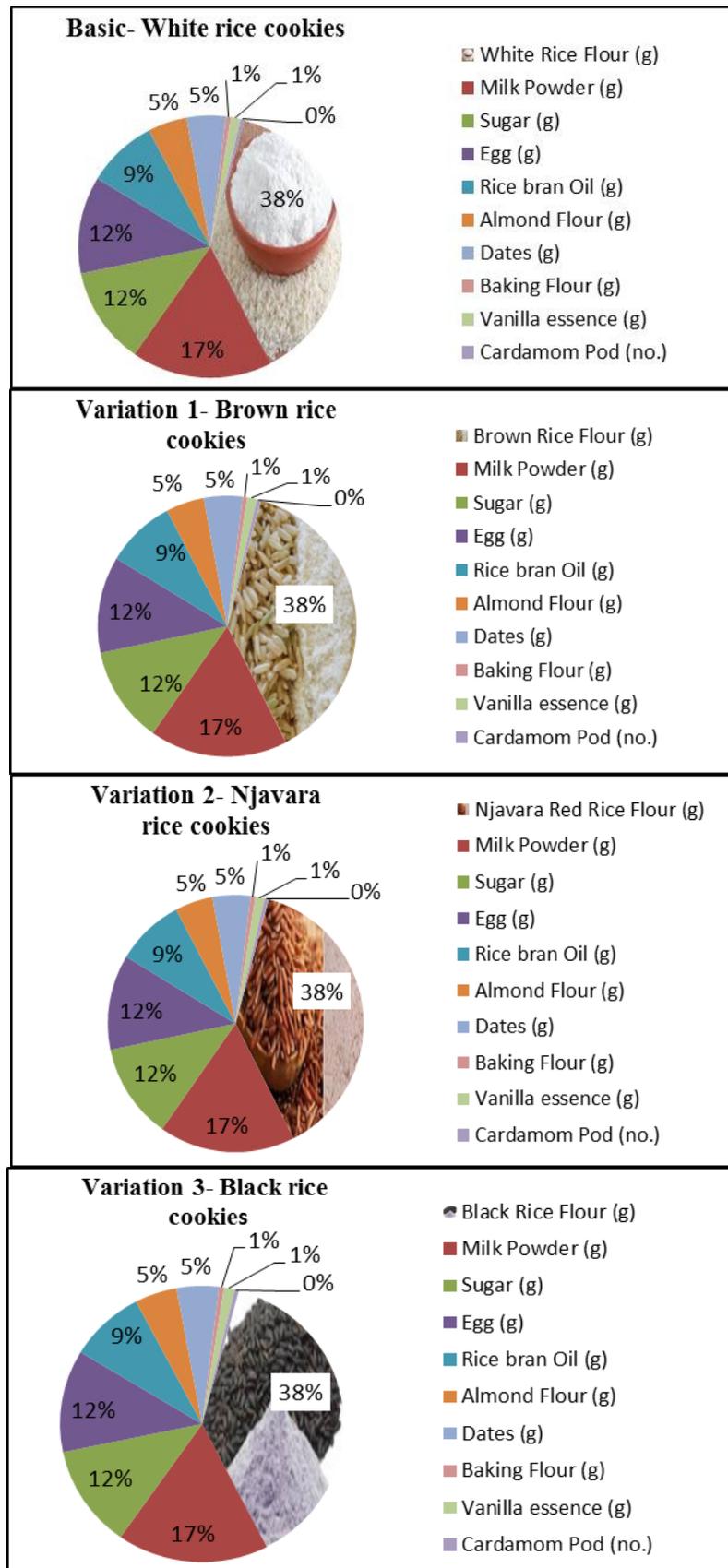


Fig. 2. Percentage composition of rice cookies variations

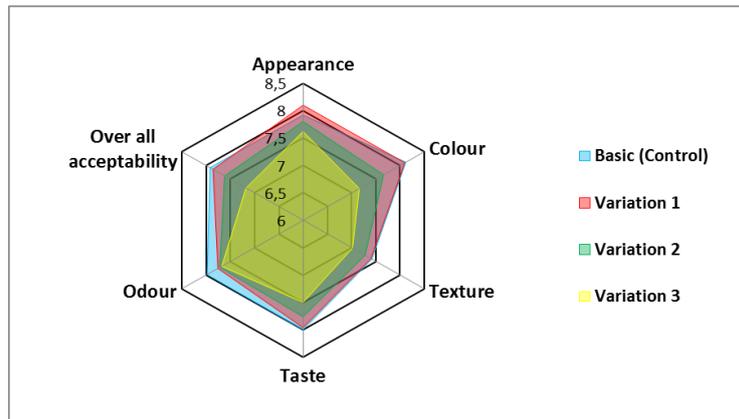


Figure 3. Sensory Evaluation of control and rice cookies variation

Post Hoc Comparison

Post hoc comparison showed that there was no significant difference between Basic and Variation 1, Basic and Variation 2 ($p > 0.05$) but there was significant difference between Basic and Variation 3 ($p < 0.05$) making variation 3 the least accepted product of all. Since the both the mean judge responses and the post hoc comparison is in favour of Variation 1 that becomes the most acceptable variation.

B) Food Action Rating Scale (FACT)

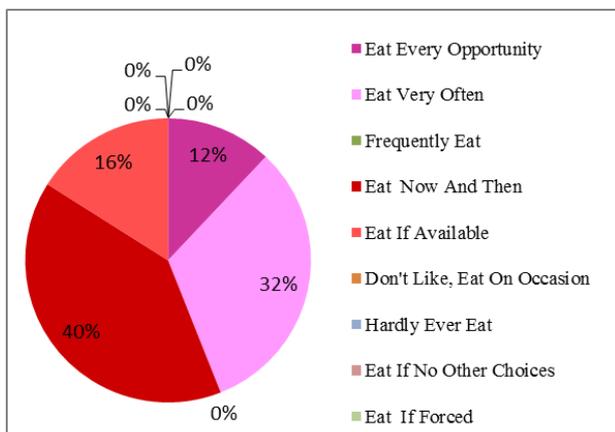


Figure 4. Food Action Rating Scale Results Of Rice Cookies

From the Food Action Rating Scale it can be inferred that 40% of the judges rated the product for Eat Now And Then, 32% of them rated the product Eat Very Often, 16% of them rated Eat If Available and 12% of them rated Eat Every Opportunity which is indicative that there was a positive psychological acceptance of the product by the panellist.

Proximate composition Analysis Of Rice Cookies

Variation 1 i.e., cookies made with brown rice was best accepted.

Table 1. Nutritional Composition of Brown Rice Cookies

Nutritional Facts	100g
Energy(Kcals)	397.18
Carbohydrates(g)	60.30
Protein(g)	10.97
Fat (g)	17.38
Total Fibre (g)	0.07

A study conducted by Islam *et al.*, 2012 on developing composite flour biscuits made with Brown rice and refined wheat flour showed similar results. Another study conducted by Mir *et al.*, 2015 on formulation of gluten free crackers using brown rice flour with incorporation of apple pomace brought about decrease in the fracture force with increase in pomace level. However the brown rice cookies developed in this study had better protein and marginally less fat and Carbohydrate content when compared to the composite flour biscuits, also was in par with the gluten free crackers developed with the incorporation of apple pomace. The brown rice cookies developed in this study can be termed gluten free as the main cereal used in this was only brown rice and can be a recommended snack for people with gluten sensitivity.

Costing Of Rice Cookies

The selling price of rice cookies made with brown rice flour per 100g of the product inclusive of packaging cost was 0.015 dollars.

Shelf Life

The brown rice cookies packed in a zip lock pouch was under observation at room temperature of approximately 30°C for a time period of 15 days. The cookies were checked for its organoleptic properties once in every 5 days. The quality of the standardized brown rice cookies was good in this time period without any signs of infestation; and the organoleptic properties of it like appearance, colour, odour was retained. However there was slight change in taste and texture on the 15th day wherein the cookies became harder and the flavour of egg couldn't be masked.

Table 2. Shelf Life Of Brown Rice Cookies

Physical Examination	At Room Temperature (30°C)		
	5 days	10 days	15 days
Days	5 days	10 days	15 days
Appearance	Brown	Brown	Brown
Odour	No off odour	No off odour	No off odour
Presence of infestation	Absent	Absent	Absent

4. CONCLUSIONS

An attempt has been made in this study by incorporation of brown rice, Njavara red rice and burma black rice instead of white rice in rice cookies recipe to increase its nutritive value. It is evident from the results that it has been achieved by the proposed method. Sensory evaluation revealed that rice cookies made with brown rice was best accepted. This product can be an ideal snack for people with gluten sensitivity.

5. REFERENCES

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