

Content available at: <https://www.ipinnovative.com/open-access-journals>

IP Journal of Nutrition, Metabolism and Health Science

Journal homepage: <https://www.jnmhs.com/>

Original Research Article

Formulation and evaluation of papad developed with partial replacement of rice flour with buckwheat (*Fagopyrum esculentum*) flour

K N Srikari¹, Shekhara Naik R¹, Mahesh Shivananjappa^{1,*}¹Dept. of Food Science and Nutrition, Yuvaraja's College (Autonomous), University of Mysore, Mysuru, Karnataka, India

ARTICLE INFO

Article history:

Received 05-04-2023

Accepted 15-04-2023

Available online 09-05-2023

Keywords:

Papad

Buckwheat

Low glycemic index

Pseudo cereal

ABSTRACT

Background: Buckwheat is one of the pseudo cereals, which goes by the scientific name *Fagopyrum esculentum*. The Buckwheat has many medicinal properties, it reduces Gastro-intestinal disorder and it also helps to reduce diabetes because of its low glycemic index. Papad is a traditional savory food also known as appalam, papadam, is a popular tasty food item in Indian dietary science.

Objective: In this study buckwheat papad was prepared by using different concentrations of buckwheat with the replacement of rice (20, 40, 60, 80, and 100%) and labeled as B1, B2, B3, B4, B5 and B6.

Materials and Methods: These formulations were analyzed for sensory attributes (n=30) by semi-trained panelists. Proximate analysis was carried out using standard A.O.A.C. methods.

Results: When the papad was evaluated for its sensory attributes, it was observed that the incorporation of buckwheat of 40% showed similar acceptability on par with control, whereas 80 and 100% replacement had lower scores in terms of overall acceptability.

Conclusion: Papad prepared with 40% replacement of buckwheat was used for nutritional analysis, which was rich in protein, fiber, & minerals like, calcium, and iron content when compared to the control. Better nutritional profile of pseudo cereal papad makes it superior compared to traditional rice papad.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

The traditional savory food 'Papad' also known as appalam, papadam, is a popular tasty food item in Indian dietary science. It is a low moisture food consumed either after frying or roasting or as an adjunct with vegetable soups and curries. Papad is a thin -crispy wafer like texture which is consumed as an accompaniment along with the meals and snacks. Roasted or grilled papad helps to absorb the fatty material from the mouth and throat. Papad should be eaten in moderate proportion; else it can become the reason for acidity. Papad is very high in sodium, hence not advisable for hypertensive people.

Pseudo cereals are plants that produce fruits or seeds which are used and consumed as grains, though botanically pseudo cereals are neither grasses nor true cereal grains. Pseudo cereals are typically high in protein and gluten-free, and are considered whole grain.¹ Buckwheat is nutritionally valuable due to the content of protein, lipid, dietary fiber, and minerals and in combination with other health-promoting components.^{2,3} The amino acid composition and nutritional value of buckwheat are superior from other grains, also one of the protein sources having high biological value.⁴⁻⁶ At the same time, buckwheat contains minerals such as zinc, copper, manganese, selenium, potassium, sodium, calcium and magnesium; also it contains vitamins such as B1, B2, B3 and B6, flavonoids, polyphenols, inositol, organic acid, and high dietary fiber.^{7,8} Buckwheat may prevent genesis of diseases such as high

* Corresponding author.

E-mail address: mayavishiva@gmail.com (M. Shivananjappa).

cholesterol, hypertension, atherosclerosis and diabetes.^{8–10} Because of these properties, it can show positive effects such as antioxidant, anti hypertensive, anti-diabetic on human health.¹¹

2. Objectives

1. To develop pseudo cereal based papad by partially replacing rice flour with buckwheat flour and its organoleptic evaluation.
2. To develop gluten free and low glycemic index papad.
3. To evaluate its sensory attributes and analyzing its nutritional composition.

3. Materials and Methods

1. *Raw materials:* The present study was carried out in the department of Food Science and Nutrition, Yuvaraja's college (Autonomous), University of Mysore, Mysuru. The raw materials were procured from local market of Mysuru such as rice flour, pepper powder, jeera and salt. The buckwheat flour was ordered from Jiwa organic.
2. *Methods of preparation:* Papad was prepared by adding different ratio of rice flour and buckwheat flour into boiling water (100°C). While addition of flour into the water makes sure that the consistency of flour was free from lumps. Pepper powder, jeera and salt were added and stirred well to prepare soft dough. Dough was made into small balls weighing about 12 g. The balls were pressed into flat discs with the help of roller pin, and then papads were sun dried. Deep fry the Papad on medium flame till golden brown and crisp.
3. *Sensory Analysis of prepared papad:* Sensory evaluation was carried out to determine the acceptability of various attributes such as appearance, taste, texture, color, flavour and overall acceptability. The product was evaluated by taking average score of the 30 semi trained panelists by using 9-point hedonic scale.
4. *Nutritional analysis of prepared papad:* Standard A.O.A.C. (1980) method was used to determine the Nutritional composition of selected variation (B3) of buckwheat and control. The moisture content was estimated by using hot air oven at 98 to 100° C, Protein content was estimated by determining total nitrogen content using standard Micro - Kjeldhal method, ash % were estimated by high temperature incineration using muffle furnace^{12,13} and fat content was estimated by the Soxhlet method. The crude fibre content was estimated by crude fibre analyzer. The carbohydrate

content was obtained by subtracting from 100 with the sum of values of moisture, protein, fat and ash content per 100 g of the sample. Minerals like Calcium, iron and phosphorous were analyzed using inductively coupled plasma mass spectrometry (ICPMS). These methods give a good precision and accuracy.¹²

5. *Statistical analysis:* Each sample was analyzed in triplicates. The data obtained was analyzed statistically using standard methods given by Snedecor- and Cochran¹³ and by Duncan's multiple range test with the $p \leq 0.05$ consider to be significant.^{14,15}

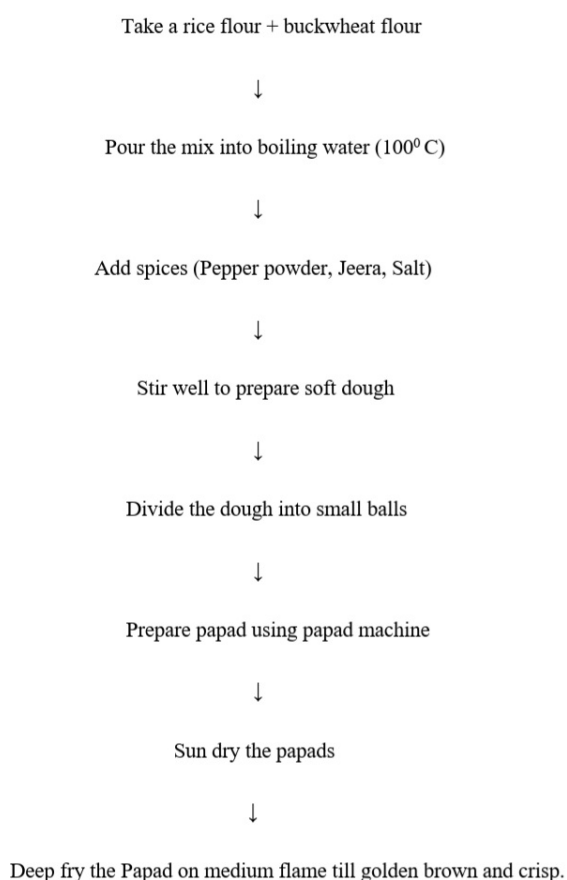


Fig. 1: Flow chart of preparation of buckwheat flour papad

4. Formulation of the Product

Table 1: Formulation of the product (ingredients g/100 gm) for preparation of buckwheat flour papad

Ingredients	B1	B2	B3	B4	B5	B6
Rice flour (g)	100	80	60	40	20	-
Buckwheat flour (g)	-	20	40	60	80	100
Pepper powder(g)	1	1	1	1	1	1
Jeera(g)	0.75	0.75	0.75	0.75	0.75	0.75
Salt(g)	3	3	3	3	3	3
Water (ml)	300	300	300	300	300	300



Fig. 2: Different variations of papad developed from buckwheat flour in comparison with rice flour papad.

5. Results and Discussion

The study was undertaken to prepare pseudo cereal papad by partially replacing rice with buckwheat. The data pertaining to the effect of incorporation of various levels of buckwheat (20, 40, 60, 80 and 100%) on sensory attributes of papad and the results are shown in Table 2. The scores obtained for all sensory attributes for B2, B3 and B4 were almost similar to the control, B5 & B6 showed decreased score and were less acceptable compare to other variations.

The proximate composition of accepted buckwheat papad (B3) and that of control were analyzed and the results of the same are shown in Table 3. The moisture content of all the variations of papad was similar. The values of protein and fat content were higher in B3 than that of control, whereas carbohydrate was less. However, fiber, ash, iron, calcium and phosphorus content were increased in buckwheat flour papad.

Table 2: Sensory evaluation of different variation of papad developed from buckwheat with partial

Variation	Appearance	Colour	Taste	Texture	Flavour	Overall acceptability
B ₁ (control)	9 ± 0	9±0	8.9±0.26	9±0	8.9±0.26	9±0
B ₂	8 ± 0	8±0	8.2±0.45	8.2±0.41	8.2±0.41	8.2±0.45
B ₃	8.2 ± 0.37	8.1±0.35	8.4±0.48	8.2±0.45	8.4±0.35	8.4±0.25
B ₄	7± 0.53	7.06±0.59	7.4±0.83	7.3±0.61	7.2±0.45	7.33±0.81
B ₅	6.9± 0.57	6.93±0.57	6.8±0.71	6.8±0.65	6.75±0.77	6.9±0.77
B ₆	6.8 ± 0.41	6.6±0.50	6.2±0.85	6.9±0.41	6.2±0.85	6.6±0.87

Replacement of rice flour. Values are mean ± SD, p ≤0.05 (Holm sidak method), n=30

Table 3: Proximate composition of selected variation (B3) of papad developed from buckwheat with partial replacement of rice flour.

Nutrients/100 g	Control (C0)	B3 (40%)
Moisture (%)	12.08 ± 2.12	11.88 ± 1.81
Carbohydrates (g)	79.25 ± 1.10	75.95 ± 1.6
Protein (g)	6.24 ± 0.71	8.5 ± 0.83*
Fat (g)	1.29 ± 0.15	2.04 ± 0.28*
Fiber (g)	2.25 ± 0.13	5.35 ± 0.3*
Ash (%)	0.39 ± 0.11	0.862 ± 0.1*
Energy (Kcal)	366 ± 3.11	363.6 ± 3.05
Iron (mg)	0.5 ± 0.11	5.1 ± 0.32*
Calcium (mg)	2.51 ± 1.09	17.7 ± 1.01*
Phosphorus (mg)	76.01 ± 1.19	92.8 ± 2.02*

Values are mean ± SD, $p \leq 0.05$ (Holm sidak), $n=3$

6. Conclusion

Papad is traditionally prepared with rice or urad dal. Here we attempted to develop papad using buckwheat flour. Rice is a high glycemic food & pseudo cereals are owing to their high fibre content & low carbohydrate content or low glycemic food. Buckwheat is gluten free and rich in antioxidants, fiber and minerals. In our study partial replacement of rice flour with 40% of buckwheat flour was acceptable. When compared to control, the selected buckwheat was superior nutritionally with high amount of fiber & minerals like calcium, iron, and has low carbohydrates. Its high fiber and low carbohydrate makes it a low glycaemic index food.

7. Source of Funding

None.

8. Conflict of Interest

None.


References


- Gimenez-Bastida JA, Zielinski H. Buckwheat as a functional food and its effects on health - A comprehensive review. *J Agric Food Chem.* 2015;63(36):7896.

- Brajdes C, Vizireanu C. Sprouted buckwheat: an important vegetable source of antioxidants. *Food Technol.* 2012;63(36):53–60.
- Krkoskova B, Mrazova Z. Prophylactic components of buckwheat. *Food Res Int.* 2005;38(5):561–9.
- Krkošková B, Mrázová Z. Prophylactic components of buckwheat. *Food Res Int.* 2005;38(5):561–8.
- Bonafaccia G, Marocchini M, Kreft I. Composition and Technological Properties of Flour and bran from common and tartary buckwheat. *Food Chem.* 2003;80(1):9–15.
- Wronkowska M, Smietana MS, Kozak UK. Buckwheat, as a Food Component of a High Nutritional Value, Used in the Prophylaxis of Gastrointestinal Diseases. *Eur J Plant Sci Biotechnol.* 2010;4(1):1–7.
- Steadman K, Burgoon M, Lewis B, Edwardson S, Obendorf R. Buckwheat seed milling fractions: description, macronutrient composition and dietary fibre. *J Cereal Sci.* 2001;33(3):271–9.
- Multari S, Neacsu M, Scobbie L. Nutritional and phytochemical content of high-protein crops. *J Agric Food Chem.* 2016;64(41):7800–11.
- Zhang ZL, Zhou ML, Tang Y. Bioactive compounds in functional buckwheat food. *Food Res Int.* 2012;49:389–95.
- Zhou X, Wen L, Li Z, Zhou Y, Chen Y, Lu Y. Advance on the benefits of bioactive peptides from buckwheat. *Phytochem Rev.* 2015;14(3):1–8.
- Bao T, Wang Y, Li YT. Antioxidant and antidiabetic properties of tartary buckwheat rice flavonoids after in vitro digestion. *J Zhejiang Univ Sci.* 2016;17(12):941–51.
- Zhang C, Zhang R, Li YM. Cholesterol-lowering activity of tartary buckwheat protein. *J Agric Food Chem.* 2017;65(9):1900–6.
- A.O.A.C. (1990) Official Methods of Analysis. 15th Edition, Association of Official Analytical Chemist, Washington DC.; 1990. Available from: [https://www.scirp.org/\(S\(czeh2tfqyw2orz553k1w0r45\)\)/reference/ReferencesPapers.aspx?ReferenceID=1929875](https://www.scirp.org/(S(czeh2tfqyw2orz553k1w0r45))/reference/ReferencesPapers.aspx?ReferenceID=1929875).
- AOAC (2005) Ash of Flour (Direct Method), Method 923.03. In: Official Methods of Analysis, 18th Edition, AOAC International Publisher, Gaithersburg.; 1995. Available from: <https://scirp.org/reference/referencespapers.aspx?referenceid=1123249>.
- Snedecor GW, Cochran WG. Statistical Methods. 17th ed. Ames: The Iowa State University Press; 1987. p. 221–2.

Author biography

K N Srikari, Post Graduate Student  <https://orcid.org/0009-0000-3980-2033>

Shekhara Naik R, Professor  <https://orcid.org/0000-0003-1527-5296>

Mahesh Shivananjappa, Assistant Professor  <https://orcid.org/0000-0003-4013-1999>

Cite this article: Srikari KN, Shekhara Naik R, Shivananjappa M. Formulation and evaluation of papad developed with partial replacement of rice flour with buckwheat (*Fagopyrum esculentum*) flour. *IP J Nutr Metab Health Sci* 2023;6(1):15-18.