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Development of Ready-to-Eat functional food prepared from seeded banana Bhimkol (*Musa balbisiana* Colla) and Black rice (*Oryza sativa L.*)

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ABSTRACT

The aim of the present study was to develop a ready-to-eat (RTE) functional food prepared from seeded banana Bhimkol (*Musa balbisiana* Colla) and Black rice (*Oryza sativa* L.) Pre-cooked black rice flour was used as the base material to develop a solid and functional food. Honey was used as a sweetener due to its low water activity of 0.6, thereby increasing the shelf-life of the product and also due to its health beneficial properties. The compromised optimal conditions obtained for the development of the RTE functional food were: 40% black rice powder, 30% bhimkol powder, 20% milk, and 10% honey. The optimized product shows the final moisture content of 8.65 ± 0.06%, the protein content of 11.48 ± 0.8%, the fat content of 2.13 ± 0.1%, ash content of 1.81 ± 0.3%, the carbohydrate content of 75.93 ± 0.45%, and the total energy of 368.69 kcal/100 g. The shelf-life study was carried out for a period of 6 weeks, which does not show any significant changes in terms of the sensory attributes. However, there is an increase in moisture content of 11.3%, a decrease in TPC, protein, and ash content of 21.5%, 13.4%, and 12%, respectively.

1. INTRODUCTION

Black rice (*Oryza sativa* L.*)* is a special variety of violet or dark purple rice, and its characteristic dark color is due to the presence of a high amount of anthocyanin as compared to other rice varieties [1]. In India, black rice is mostly cultivated in Puducherry, Odisha, West Bengal, Tamil Nadu, and Jharkhand; and in the North Eastern part of India, the Meitei community of Manipur is involved in the cultivation of black rice that is popularly known as Chak-hao Amubi [2]. It is richer in antioxidant activities, has high protein content and low-fat content, gluten-free, gut-friendly, and is a natural cleaner with many medicinal values in comparison to other rice varieties [3,4]. The rice kernel bran layer is a rich source of many pharmacological compounds such as anthocyanins, phenolic, and flavonoid compounds which have the ability to improve the lipid profiles are anti-inflammatory and anti-cancerous and may also help in the prevention of diabetes and heart diseases, cancer, high blood pressure, and extend the quality of life [5].

Because it has anthocyanin, black rice is usually eaten with the bran and is sold as "unmilled" rice. However, still black rice is not so popular as a staple food as compared to red and white rice [6]. In recent times, black rice has been considered as functional food because of its anti-carcinogenic, curative effect, anti-oxidant properties, and high nutritive value [7].

Musa balbisiana Colla (genome group "AA") the seeded banana is locally called bhimkol. It belongs to the family Musaceae and is mostly available both in wild and cultivated types in the North Eastern part of India [8]. Bhimkol is wildly grown in the Upper Assam region and is semi-domesticated along river sides where human habitats are present [9]. Bhimkol is robust in growth, very hardy, resistant to pests, diseases, drought, and high yielders [10]. Conventionally, feeding infants with bhimkol is a common practice in the North-east region of India because it is highly nutritious and is a rich source of carbohydrates, vitamins, and proteins. It has also proved to be beneficial for the treatment of diseases such as dysentery and jaundice [11]. The majority of the ethnic groups of Assam use different parts of the plant in the form of food or in their religious and social activities. In a recent study conducted by Borah *et al*. [12] on low-cost healthy extrudates of low amylose rice and bhimkol formulation, it was found that the developed product at the optimized condition was found to have a calorific value of 175 kcal/100g and protein content of 6.35% with an adequate amount of micronutrients such as magnesium (15.3 mg/100g) and potassium (33.2 mg/100g), respectively.

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The market for convenience foods has expanded rapidly in recent years. Ready-to-eat (RTE) products are becoming increasingly popular among consumers due to their low time and effort requirements [13]. Ready-to-eat (RTE) foods are foods that require minimal cooking time and have a good storage shelf life. With the increase in the number of working women, busy lifestyles, and so on, most people prefer an easy and quick way of cooking food over the old traditional method, which takes time. Thus, the entrance of ready-to-eat (RTE) food in the global market and presently in the Indian markets has seen a tremendous shift in the pattern of consumption over the past few years [14]. There is very limited research on RTE functional food prepared from a combination of black rice and bhimkol. The main reason is bhimkol being an underutilized horticultural crop as it contains large number of seeds as compared to its pulp. Therefore, the aim of the present study was to develop RTE functional food prepared from black rice and bhimkol.

2. MATERIALS AND METHODS

Fresh and ripened Bhimkol (*Musa balbisiana Colla*) and black rice (*Oryza sativa* L.), were procured from the local market of Mangaldai, Assam, India. The honey (Brand Dabur) was bought from the local grocery shop. It imparts a characteristics sweet flavor to the product. The raw milk (cow milk) was procured from a local milk vendor, Mangaldai. The low density polyethylene (LDPE) pouch for product storage was procured from an online shopping platform (Flipkart).

2.1. Preparation of Black Rice Flour

Black rice was cleaned using clean potable water, and after complete draining of the water, the rice was ground using a kitchen mixer for 5 min, and then it was cooked for 5 min using a microwave oven at 900W. Then, after cooling the cooked rice, it was formed into small ball-like structures and dried at 40°C for 24 h in a tray drier. After that, the grinding of the dried rice balls was carried out using a kitchen mixer, and the flour, after proper sieving, was stored in airtight containers for further use. Rice flour was used as the base material for the product formulation.

2.2. Preparation of Bhimkol Powder

Mature and ripe bhimkol were washed in clean and potable water. After peeling, the seeds were removed using a grater, and the pulp was dried using a tray drier for 12 h at 45°C. The dried pulp was then ground into powder using a mixer grinder. The flour obtained after proper sieving was stored in airtight containers for further use. Bhimkol powder was used as the functional ingredient for the product formulation.

2.3. Preparation of the Dough

The dough was prepared by mixing black rice powder, bhimkol powder, and milk as the binding agent and honey as the sweetening agent. The prepared dough was then dried using a hot air oven at 40°C for 6 h, and the product was stored in LDPE pouch for better storage.

2.4. Product Formulation

A total of eight trials were conducted to determine the best product combinations for the composite flour design [Table 1].

2.5. Proximate Analysis

For proximate analysis, protein, fat, moisture, and ash were analyzed using the AOAC, 2000 [15] methods. The carbohydrate content was estimated by subtracting the sum of the percentages of moisture, fat, protein, and ash contents from 100% according to AOAC, 2000 [15].

$$\text{Carbohydrate (\%)} = 100 - (\text{moisture\%} + \text{fat\%} + \text{protein\%} + \text{ash\%})$$

The total energy value of the food formulation was calculated according to the method of Mahgoub [16] as:

$$\text{Total energy (kcal/100 g)} = [(\%\ \text{available carbohydrates} \times 4) + (\%\ \text{protein} \times 4) + (\%\ \text{fat} \times 9)]$$

2.6. Color Analysis

The color values of the RTE food prepared from black rice and bhimkol in terms of L, a, b values were measured using a color measurement spectrophotometer [L* = 0 (black) to 100 (white); a*=−60 (green) to +60 (red); and b*=−60 (blue) to +60 (yellow)].

2.7. Total Phenol Content

The total phenol content of the juice was estimated by the Folin-Ciocalteu method with a gallic acid standard, and the absorbance was measured at 650 nm using a UV/VIS spectrophotometer [17].

2.8. Water Absorption Index (WAI) and Water Solubility Index (WSI)

Water Absorption Index and Water Solubility Index were determined using the Anderson [18] procedure.

$$\text{WAI}\ (\%) = \frac{(Wt.of\ wet\ sample - Wt.of\ dry\ sample)}{(Wt.of\ dry\ sample)}$$

$$\text{WSI}\ (\text{g}/\text{g}) = \frac{Wt.of\ dissolved\ solid\ in\ supernatant}{Wt.of\ dry\ solids}$$

2.9. Sensory Assessment

The sensory quality of the product was evaluated at Mangaldai College by a panel of ten panelists comprised of students and faculty members ranging in age from 20 to 40 years. The 9-point hedonic scale was used (1: dislike extremely, 9: like extremely), where a score of 5 was the lowest limit of acceptance.

2.10. Storage Study

During the storage period of 6 weeks, different properties such as moisture content and total phenolic content changes were studied. The data were collected during the 1st week and then at an interval of 7 days up to 6 weeks.

2.11. Statistical Analysis

All the experiments were carried out in triplicates and the results were expressed as mean ± standard deviation calculated using MS Excel.

Table 1: Ingredient formulation

Ingredients	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Black rice powder	40	50	40	40	40	30	30	25
Bhimkol powder	40	40	50	30	30	30	30	25
Milk	10	5	5	20	10	30	10	30
Honey	10	5	5	10	20	10	30	20

3. RESULTS AND DISCUSSION

Eight different combinations of the product are taken and among them, T_4 having black rice powder, bhimkol powder, milk, and honey in the ratio of 40:30:20:10 (all in %) showed the best product combination. In T_1 and T_5, although the product is formed and is similar to T_4 after sensory analysis, it shows the best result thus has been accepted as the final product. In T_2 and T_3, the product did not form proper dough and it may be due to a high amount of solid ingredients (black rice and bhimkol powder) as compared to liquid components (milk and honey). In T_6, T_7, and T_8, the dough becomes sticky, it may be due to the high amount of liquid component as compared to the solid ingredients.

The moisture content of the final product (T_4) was determined to be 8.65±0.06% [Table 2], and it plays an important role in extending the product's shelf life [19] because chemical and physical deteriorations are less likely to occur at such low moisture content [20]. According to Kumar *et al*. [21], the protein content of black rice is 8.5 g/100g. Bhimkol powder may have a good contribution toward the high protein content and was found to be 11.48 ± 0.8% which shows that it can have a good impact on the nutritional value as RTE products are basically cereal-based and found to have low nutritional value. The fat and ash content was found to be 2.13 ± 0.1% and 1.81 ± 0.3%, respectively. Similarly, the ash content of pork patties developed using black rice was found to be 1.93 ± 0.01^{bc}% [22] which is slightly higher than our product. Again in the development of Gluten-free rice and bean biscuit [23], the ash content was 1.87^{b} ± 0.04% which is almost similar to our product. The carbohydrate content of the final product accounts for 75.93 ± 0.45% and it falls within the range as per Codex Alimentarius Standards for weaning foods. Total energy (kcal/100 g) was calculated to be 403.41 kcal/100g which is slightly lower than the minimum energy (451 Kcal/100g) recommended in the Codex Alimentarius.

The total phenolic content was found to be 13.04 ± 0.5. A slightly higher TPC has been found by other authors [24] in the study of banana powder as an additive to common wheat pasta. The color values of the RTE food prepared from black rice and bhimkol in terms of L, a, and b values were 45.11 ± 0.5, 0.38 ± 0.05, and 9.18 ± 0.1, respectively, as illustrated [Table 2]. The sensory assessment of the product has been found that T_4 shows the best overall acceptability as compared to the others. The comparison among the different trials has been outlined [Table 3].

Table 2: Analysis of RTE functional food prepared from black rice and bhimkol flour

Parameter	Result
Moisture content (%)	8.65±0.06
Protein (%)	11.48±0.8
Fat (%)	2.13±0.1
Ash (%)	1.81±0.3
Carbohydrate (%)	75.93±0.45
Total energy (kcal/100 g)	368.69
Total phenolic content (mg GAE/100 g)	13.04±0.5
L	45.11±0.5
A	0.38±0.05
B	9.18±0.1
WSI (g/g)	0.28±0.87
WAI (%)	34.15±0.6

The product does not contain any added preservatives and the storage study was carried out over a period of 6 weeks at a temperature of 37°C and relative humidity of 80% and was stored in an LDPE pouch. The data thus obtained are analyzed to determine the storage stability of the product which is illustrated [Table 3].

After a storage study of 6 weeks, it can be seen that the moisture content goes on increasing with the increase in time [Table 4]. An increase in storage time can have an adverse effect on the storage life of the product because a rise in moisture can aid in the growth of microorganisms, which is one of the major causes of food spoilage. This increase in moisture might be due to improper packaging technique (e.g., not properly sealed) and high relative humidity of the ambient air entering into the LDPE pouch [25].

Phenolic compounds are very important constituents of plants bearing redox properties that are responsible for their antioxidant activity [26]. Das *et al*. [10] reported that at normal room temperature the TPC of bhimkol powder decreases with increasing storage time as compared to that stored at refrigerated storage temperature. In our study, the product containing bhimkol and black rice powder also follows the same trend of decrease of TPC with the increase in storage time of 6 weeks as shown [Table 4]. The decrease in TPC accounts for a 21.5% decrease in the 6th week of the study which is similar to the work reported by Deng *et al*. [27].

In the research study by Akhtar *et al*. [28], it has been reported that there is a progressive decrease in protein content of mango pulp over the entire storage period of 90 days. Again, Oessoe *et al*. [29] reported that different types (four rice varieties) show a decrease in protein content over storage, and the largest decrease in protein contents was experienced by the red rice which was 10.69% in the initial month and decreased to 5.24% at the end of 6 months and the percentage reduction in protein content accounts for 54.5%. Thus, it can be summarized from the mentioned research study that the protein content of the product containing bhimkol and black rice flour shows decreasing trend with an increase in storage time [Table 4]. The decrease in protein content accounts for a 13.4% decrease as compared to that of the initial week. The decrease in protein content may be due to the Maillard reaction occurring between different components present in the product, and in the case of milk products, it is very important since these are the only naturally-occurring protein foods with a high content of reducing sugar Hurrell *et al*. [30] and our product contain milk as the binding agent which also imparts a characteristic flavor to the product.

Ash refers to the inorganic residue remaining after either ignition or complete oxidation of organic matter in a food sample [31]. It is a part of proximate analysis for nutritional evaluation. On storage, at normal room temperature, the ash content of the product shows a decreasing trend with increasing time, and the decrease in ash content on storage accounts for a 12% decrease on the 6th week. The ash content shows the opposite trend of increasing on an increase in time from 0.80% to 0.82% during the storage duration of 6 months in the work by Khadra *et al*. [32].

4. LIMITATIONS OF THE STUDY

The seeds present in bhimkol are one of the main limitations faced during the study, because the seeds are to be removed before preparation of the bhimkol flour and also the flour has high tendency to agglomerate with increase in storage time and temperature.

Table 3: Sensory assessment of the product

Parameters	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Colour	7±0.3	7±0.3	6±0.2	8±0.2	7±0.1	6±0.1	7±0.2	6±0.3
Appearance	7±0.1	7±0.4	5±0.4	8±0.4	7±0.4	7±0.4	7±0.4	7±0.4
Taste	7±0.3	7±0.1	6±0.3	8±0.5	7±0.5	6±0.5	7±0.5	6±0.5
Mouth feel	6±0.2	7±0.1	6±0.1	8±0.3	7±0.2	7±0.1	7±0.1	5±0.1
Overall Acceptability	6±0.3	6±0.1	6±0.1	8±0.1	6±0.1	6±0.1	7±0.1	6±0.3

Table 4: Shelf–life study of the product

Week	TPC (mg GAE/100g)	Moisture Content (%)	Protein (%)	Ash (%)
1	13.04±0.05	8.65±0.06	11.48±0.8	1.81±0.3
2	12.87±0.03	8.87±0.02	11.23±0.5	1.78±0.2
3	12.35±0.04	9.05±0.02	11.03±0.3	1.75±0.2
4	11.84±0.02	9.45±0.05	10.88±0.5	1.72±0.4
5	11.23±0.03	9.69±0.02	10.46±0.4	1.70±0.3
6	10.89±0.06	9.78±0.06	10.14±0.3	1.69±0.3

5. CONCLUSION

Bhimkol flour, along with black rice flour used for the development of RTE functional food, can prove to be the best alternative flour for gluten-free snacks as well as a source for baby food development. However, the processed form of bhimkol is very negligible, although it is a very rich source of minerals. The product formulated without the use of any preservatives and stored at room temperature in an LDPE pouch shows a good shelf life without much change in the sensory attributes. However, the other properties, such as moisture, protein, ash, and mineral content, had a significant change over a storage period of 6 weeks. With the increase in urbanization, the incorporation of healthier foods such as bhimkol (seeded banana) and others has lost its value in food habits; thus, the addition of bhimkol powder (seeded banana) can prove to be a healthier option for food processing industries. Functional foods are foods that have an additional function often one related to health promotion and disease prevention by adding new ingredients or more of existing ingredients. The ready-to-eat functional food with bhimkol and black rice powder as the main ingredients will essentially try to serve itself as a medicinal food, as both black rice and bhimkol have several health benefits while also providing a characteristic taste. The study thus standardized an RTE functional food using black rice and seeded banana flour which can provide both nutrition and health benefits both to the younger as well as the adult section of the population.

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7. AUTHORS' CONTRIBUTIONS

Himakshi Baishya participated in the concept and research design, data analysis, interpretation of analysis results, and writing the manuscript. Ranjita Goswami participated in designing the research and statistical analysis. Lakhya Jyoti Gogoi participated in designing the research, revising the important content of the manuscript, and correspondence. All authors read the final draft and approved it for communication

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9. CONFLICTS OF INTEREST

The authors report no financial or any other conflicts of interest in this work.

10. ETHICAL APPROVALS

This study does not involve experiments on animals or human subjects.

11. DATA AVAILABILITY

The authors confirm that all the data underlying the findings are fully available without restriction. All the data is included within the manuscript.

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REFERENCES

1. Zhaohua H, Peiyou Q, Yan Z, Songhuan C, Guixing R. Identification of anthocyanins isolated from black rice (*Oryza sativa* L.) and their degradation kinetics. Food Res Int 2013;50:691-7.
2. Saha S, Vijayakumar S, Saha S, Mahapatra A, Kumar RM, Sundaram RM. Black rice cultivation in India prospects and opportunities. Chronicle Bioresource Manag 2022;6:44-8.
3. Tharmabalan TR, Rajeev B, Wan N. Physiochemical properties, proximate composition, and cooking qualities of locally grown and imported rice varieties marketed in Penang, Malaysia. Int Food Res J 2013;20:1345-51.
4. Pankaj J, Arup D, Chandra DS. Optimization of saccharification conditions of black rice (cv. Poireton) using microbial strains through response surface methodology: Optimization of black rice saccharification parameters. J Inst Brewing 2017;123:423-31.
5. Thanuja B, Parimalavalli R. Role of black rice in health and diseases. Int J Health Sci Res 2018;8:241-8.
6. Pratiwi R, Purwestri YA. Black rice as a functional food in Indonesia. Funct Foods Health Dis 2017;7:182-94.
7. Kumari S. Black rice: An emerging "super food". Pantnagar J Res 2020;18:15-8.
8. Upasana S, Kumar GV, Akanksha Y. The traditional and therapeutic use of banana and its plant-based delicacies in ethnic Assamese cuisine and religious rituals from Northeast India. J Ethnic Foods 2020;7:21.
9. Borborah K, Borthakur SK, Tanti B. A new variety of *Musa balbisiana* Colla from Assam, India. Bangladesh J Plant Taxonomy 2016;23:75-8.
10. Priyanka D, Ramala D, Singha DA, Chandra BR. Studies on

nutritional components, antioxidant activities and microbial load in simple processed product developed from banana (cv. Bhimkol). Asian J Chem 2016;28:47-50.
11. Bikash GM, Indrani C, Kumar SB, Tankeswar N, Swapnil B, Kuntal D, *et al*. Study of androgenesis in (*Musa balbisiana*) cv. Bhimkol banana and *in-vitro* regeneration of haploids using isolated microspore culture. Int J Curr Microbiol Appl Sci 2020;9:2555-65.
12. Anjan B, Deepjyoti KD, Manuj KH, Rupak M, Charu LM. Low-cost healthy extrudates of rice and bhimkol (*Musa balbisiana*, ABB) formulated through linear programming. J Food Proc Eng 2019;42:e13201.
13. Silberbauer A, Schmid M. Packaging concepts for ready-to-eat food: Recent progress. J Package Technol Res 2017;1:113-26.
14. Garima G, Binod S, Vimal B. A study on consumer perception towards ready-to-eat food with special reference to Pune. Shodh Sarita 2020;28:72-7.
15. AOAC International. Official Methods of Analysis of the AOAC International. The Association. 16th ed. Gaithersburg, MD: AOAC International; 2000.
16. Mahgoub SE. Production and evaluation of weaning foods based on sorghum and legumes. Plants Foods Hum Nutr 1999;54:29-42.
17. Baran DA, Suvendu B. Characterization of the batter and gluten-free cake from extruded red rice flour. LWT Food Sci Technol 2019;102:197-204.
18. Anderson RA, Conway HF, Pfeifer VF, Griffin E. Gelatinization of corn grits by roll and extrusion cooking. Cereal Sci Today 1969;14:4-12.
19. Gibson A, Oluwatooyin O. Determination of the functional and keeping qualities of extruded soy-cocoa and corn starch-based complementary food. Sky J Food Sci 2015;4:30-41.
20. Pilairuk I, Bhesh B. Chemical deterioration and physical instability of food powders. In: Chemical Deterioration and Physical Instability of Food and Beverages. 2010. p. Sawston, United Kingdom: Woodhead Publishing Series in Food Science, Technology and Nutrition; 663-700.
21. Kumar N, Murali RD. Black rice: A novel ingredient in food processing. J Nutr Food Sci 2020;10:771.
22. Sin-Young P, Jong-Wan L, Gye-Woong K, Hack-Youn K. Effect of black rice powder on the quality properties of pork patties. Korean J Food Sci Anim Resources 2017;37:71-8.
23. David WS, Bolini H, Maria A, Maria T, Pedrosa S, Heliyon C. Gluten-free rice and bean biscuit: Characterization of a new food product. Heliyon 2021;7:e05956.
24. Biernacka B, Dziki D, Rozyło R, Gawlik-Dziki U. Banana powder as an additive to common wheat pasta. Foods 2020;9:53.
25. Ali MA, Hasan SM, Mahomud MS, Sayed MA. Processing and storage of instant cooked rice. Bangladesh Res Publ J 2012;7:300-5.
26. Soobrattee MA, Neergheen VS, Luximon-Ramma A, Aruoma OI, Bahorun T. Phenolics as potential antioxidant therapeutic agents: Mechanism and actions. Mutat Res 2005;579:200-13.
27. Mei D, Yuanyuan D, Lihong D, Yongxuan M, Lei L, Fei H, *et al*. Effect of storage conditions on phenolic profiles and antioxidant activity of litchi pericarp. Molecules 2018;23:2276.
28. Saeed A, Muhammad R, Anwaar A. Physico-chemical, microbiological and sensory stability of chemically preserved mango pulp. Pak J Bot 2010;42:853-62.
29. Oessoe YY, Maramis R, Warouw OO, Mandey LC. Changes on carbohydrates and protein content in North Sulawesi local rice during storage. IOSR J Environ Sci Toxicol Food Technol 2014;8:16-21.
30. Hurrell RF, Finot PA. Food processing and storage as a determinant of protein and amino acid availability. Exp Suppl 1983;44:135-56.
31. Ismail B. Ash content determination. In: Food Analysis Laboratory Manual: Food Science Text Series. Cham: Springer; 2017. p. 117-9.
32. EI-Kady AA, Abou Khadra SH, Nessreen N Bassuony, Hassan HM. Effect of storage conditions on grain quality characters of some special rice varieties. Egypt J Plant Breed 2013;17:70-84.

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