

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(9): 1191-1195
www.biochemjournal.com
Received: 03-07-2024
Accepted: 09-08-2024

Shivani Singh
Research Scholar, Department
of Food Science and Nutrition,
Chandra Shekhar Azad
University of Agriculture &
Technology, Kanpur, Uttar
Pradesh, India

Seema Sonkar
Associate Professor,
Department of Food Science
and Nutrition, Chandra
Shekhar Azad University of
Agriculture & Technology,
Kanpur, Uttar Pradesh, India

Pragya Mishra
Teaching Associate,
Department of Food Science
and Nutrition, Chandra
Shekhar Azad University of
Agriculture & Technology,
Kanpur, Uttar Pradesh, India

Vikas Gautam
Research Scholar, Department
of Agricultural Biochemistry,
Chandra Shekhar Azad
University Of agriculture &
Technology, Kanpur, Uttar
Pradesh, India

Corresponding Author:
Shivani Singh
Research Scholar, Department
of Food Science and Nutrition,
Chandra Shekhar Azad
University of Agriculture &
Technology, Kanpur, Uttar
Pradesh, India

Physicochemical and sensory properties of black wheat products cookies

Shivani Singh, Seema Sonkar, Pragya Mishra and Vikas Gautam

DOI: <https://doi.org/10.33545/26174693.2024.v8.i9o.2376>

Abstract

Black wheat is a unique variety of wheat known for its dark, rich color and enhanced nutritional properties. Unlike traditional wheat, black wheat boasts higher levels of anthocyanins, the antioxidants responsible for its striking hue, which also confer anti-inflammatory and diseases fighting benefits. This grain not only offers a visual allure but also packs a punch with its superior protein and mineral content, including zinc and iron. Its deep, early flavor and several health benefits position black wheat as a super food poised to revolutionize modern diets. The aim of present study was to develop value added products black wheat flour incorporated with ragi& bajra flour indifferent ratio. After the development of the black wheat cookies to evaluate physicochemical, sensory, and shelf quality of the products.

The result of standardized cookies prepared with (black wheat flour ragi flour: bajra flour) in four treatments. Data related to overall acceptability revealed that the combination T₁ was liked extremely it showed the highest score among all the treatments and control sample on the basis of sensory characteristics viz colour (8.36±0.34), Taste (8.57±0.21), Texture (7.91±0.57), Flavour (8.46±0.31), Appearance (8.25±0.51), after taste (8.34±0.38), & overall acceptability (7.87), then all counter parts. While Data also revealed that increasing the incorporating of ragi and bajra flour is resulted a decrease the sensory parameters. This could be due to the property of black wheat flour improved the texture and appearance and taste of the cookies. In proximate analysis cookies has crude protein (7.31-8.73 percent), crude Fiber (4.63%), crude fat (3.7%), moisture (1.96%) Carbohydrate (77.14) and minerals Iron (9.95), zinc (3.11) and calcium (1.55). The proximate parameters of all treatments of cookies were higher than control sample. Thus, it can be concluded above results that developed products were good in acceptability, nutritionally rich and safe for human consumption

Keywords: Black wheat, ragi, bajra, health benefits, antioxidants, sensory evaluation

Introduction

In India has a tragic in spite of being the world's second-largest food production country, malnutrition particularly among children continues to be a major obstacle to the nation's progress. Malnutrition is caused by a variety of circumstances, some of which include insufficient breastfeeding, limited access to wholesome food especially when food prices increase and several types of infections.

The term "malnutrition" refers to deficiencies, excesses, or imbalances in a person's consumption of energy and/or nutrients. It falls into two major groups of conditions. The first is categorized as "under nutrition," which refers to a deficiency of essential nutrients that can halt growth both inside and externally, leading to stunting and under weight, for example. Malnutrition includes the second group, which is related to overeating and conditions including obesity, diabetes, and heart disease

The current scenario of school-age children's health and nutrition in India is far from ideal. According to data from the National Family Health Survey NFHS 5 –(2019-21) as per the recent report, the nutrition indicators for children under 5 years have improved as compared with NFHS-4 (2015-16). Stunting has reduced from 38.4 to 35.5, wasting has reduced from 21.0 to 19.3 percent and underweight prevalence has reduced from 35.8 to 32.1 percent. Further, under Poshan Abhiyan, "Poshan Tracker" application was rolled out on 1 March 2021, as an important governance tool. Technology is being leveraged for dynamic identification of stunting, wasting, underweight prevalence among children across the country.

Globally, wheat (*Triticum aestivum* L.) is the most significant and extensively cultivated crop. Due to its great production and wide range of adaptation, it is the oldest known staple food crop and is referred to as the "King of Cereals" (Kanno *et al.*, 2022) ^[10]. Purple and blue wheat were crossed to produce black wheat, a coloured or pigmented variety of wheat. Wheat grain's outer layer contains anthocyanin, which gives it its black colour. Among other beneficial and useful components, it includes phenolic compounds, anthocyanin, carotenoids, phytic acid, essential amino acids, dietary fibre, vitamins, and minerals. Compared to typical yellow wheat, black wheat has higher levels of protein, dietary fibre, calcium, vitamin K, total flavonoid, total phenolic content, and antioxidant activity. Millets are cultivated around the world with several key players dominating production due to favourable climates and effective agricultural practices. India leads as the top millet producer leveraging its diverse agro-ecological zones to grow a wide variety of millets and meet global demand (Kumar & Singh, 2018) ^[5]. China is another significant

producer, where millets play a central role in traditional diets and farming systems (Wang *et al.*, 2019) ^[11]. In Africa, countries like Nigeria and Burkina Faso excel in millet cultivation, thriving in their arid environments that perfectly suit these drought-tolerant grains (Oni *et al.*, 2020) ^[9]. Meanwhile, the United States is expanding its millet production, driven by increasing interest in healthy and alternative crops (Jones & Williams, 2021) ^[4].

Methods and Materials

Procurement of raw material

The present study was carried out in the Department of Food Science and Nutrition, College of Community Sciences, Chandra Shekhar Azad University of Agriculture And Technology, Kanpur, UP, 208002. Black wheat and other food ingredients required to develop food were purchased from the local market of Kanpur city. All the equipments, chemicals, utensils used during the study were procured from the department.

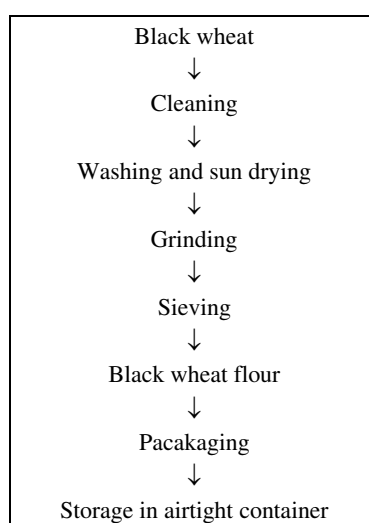


Fig 1: Flow chart of processing of Black wheat flour

Development of the black wheat product

Table 1: Showed that the flour of black wheat, ragi and bajra were prepared the cookies in different ratio and fig. 2 also showed the method of development of black wheat cookies. as T₁, T₂, T₃, T₄ was found (T₁-50 gm Black wheat flour, 5

gm Ragi flour, 5 gm Bajra flour, (T₂-40 gm Black wheat flour, 10 gm Ragi flour, 10 gm Bajra flour), (T₃-30 gm Black wheat flour, 15 gm Ragi flour, 15 gm Bajra flour), (T₄- 20 gm Black wheat flour, 20 gm Ragi flour, 20 gm Bajra flour) respectively.

Table 1: Standardized of Black wheat Cookies incorporated with Ragi and Bajra:

S. No.	Ingredients	Quantity	Control (T ₀)	T ₁	T ₂	T ₃	T ₄
1.	Wheat flour(gm)	100 gm	60	—	—	—	—
2.	Black wheat flour (gm)	100 gm	—	50	40	30	20
3.	Ragi (gm)	100 gm	—	5	10	15	20
4.	Bajra (gm)	100 gm	—	5	10	15	20
5.	Low Fat Butter(gm)	10	10	10	10	10	10
6.	Powdered Sugar(gm)	25	25	25	25	25	25
7.	Poppy Seeds(gm)	2	2	2	2	2	2
8.	Baking Powder	1 tsp	1 tsp	1 tsp	1 tsp	1 tsp	1 tsp
9.	Baking Soda	1 tsp	1 tsp	1 tsp	1 tsp	1 tsp	1 tsp
10.	Vanilla Essence	1 drop	1 drop	1 drop	1 drop	1 drop	1 drop
	TOTAL	100 gm	100 gm	100 gm	100 gm	100 gm	100 gm

Development of the product

The cookies were prepared using the following method shown in fig: 2.

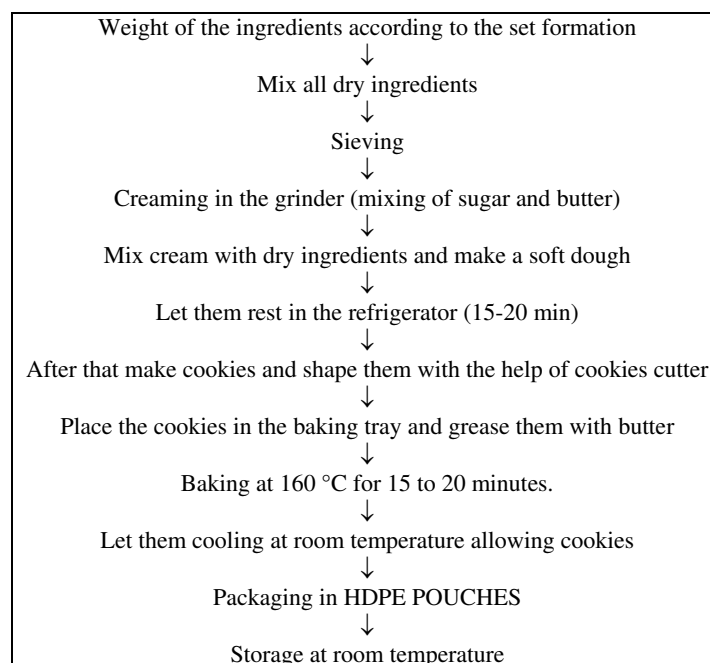


Fig 2: Flow Chart of preparation of Black wheat cookies

Sensory Evaluation

All treatment of black wheat cookies were for the subjected to sensory evaluation by Skilled panel members of using 9 point hedonic scale the score was noted on basis of sensory score card.

Physicochemical Evaluation

All treatment of black wheat cookies were analyzed moisture, crude protein, crude fat, crude fiber, total ash and carbohydrate by AOAC method.

Statistical Analysis

The mean and standard deviation were calculated in three parallel replicates. All the analysis was done using Completely Randomized Design (CRD) tool in Microsoft Excel. To determine the significance, an ANOVA was computed for each of the sensory evaluation's features.

Results and Dissuasion

The results of nutritional composition of control (T₀) and

black wheat cookies incorporated with ragi and bajra flour (T₁, T₂, T₃, T₄) are given in the table2. Nutritional comprises of total moisture, total ash, crude fiber, crude fat, crude protein and carbohydrate.

Moisture Content: Table 2 demonstrated that the moisture content of the developed cookies coded as T₁, T₂, T₃, T₄ was found (T₁-50 gm Black wheat flour, 5 gm Ragi flour, 5 gm Bajra flour, (T₂-40 gm Black wheat flour, 10 gm Ragi flour, 10 gm Bajra flour), (T₃-30 gm Black wheat flour, 15 gm Ragi flour, 15 gm Bajra flour), (T₄- 20 gm Black wheat flour, 20m Ragi flour, 20 gm Bajra flour) respectively. Whereas control cookies coded as T₀ was found (60 gm whole wheat flour, 10 gm butter, 25 gm sugar) there was a significant difference developed cookies and control cookies. The moisture content of developed cookies was observed (T₁- 2.23%, T₂-2.26%, T₃- 3.06%, T₄- 3.23%) was more than control cookies (T₀-1.96%) respectively. The moisture content of the black wheat cookies were decreased with the addition of ragi flour and bajra flour.

Table 2: Mean ± SD scores of Proximate Analysis of Cookies

Treatment	Total moisture	Total ash	Crude fiber	Crude fat	Crude protein	Carbohydrate
Control	1.96±0.12	1.63±0.12	1.8±0.16	2.1±0.08	7.31±0.02	85.18±0.51
T ₁	2.23±0.12	1.9±0.08	3.8±0.08	2.3±0.08	7.44±0.02	82.49±0.22
T ₂	2.26±0.12	2.1±0.08	4.2±0.08	2.7±0.08	7.68±0.01	80.65±0.38
T ₃	3.06±0.12	2.3±0.08	4.33±0.12	3.03±0.12	7.89±0.02	79.37±0.47
T ₄	3.23±0.12	2.5±0.08	4.63±0.12	3.7±0.12	8.73±0.02	77.16±0.47
SE(D)	0.09	0.06	0.08	0.07	0.01	0.3
CD @ (5%)	0.28	0.2	0.27	0.23	0.04	0.95

The ash content of the developed cookies coded Whereas control cookies coded as T₀ was found (60 gm whole wheat flour, 10 gm butter, 25 gm sugar) there was a significant difference developed cookies and control cookies. The ash content of developed cookies was observed (T₁- 1.9%, T₂- 2.1%, T₃- 2.3%, T₄- 2.5%) was more than control cookies

(T₀-1.63%) respectively. The ash content of the black wheat cookies were increased with the addition of ragi flour and bajra flour.

The fiber content of developed cookies was observed (T₁- 3.8%, T₂-4.2%, T₃- 4.33%, T₄- 4.63%) was more than control cookies (T₀-1.8%) respectively. The fiber content of

the black wheat cookies were increased with the addition of ragi flour and bajra flour. The fat content of developed cookies was observed (T₁- 2.3%, T₂-2.7%, T₃- 3.03%, T₄- 3.7%) was more than control cookies (T₀-2.1%) respectively. The fat content of the black wheat cookies decreased with the addition of ragi flour and bajra flour.

The protein content of developed cookies was observed (T₁- 7.44%, T₂-7.68%, T₃- 7.89%, T₄- 8.73%) was more than control cookies (T₀-7.31%) respectively. The protein content

of the black wheat cookies increased with the addition of ragi flour and bajra flour.

The carbohydrate content of developed cookies was observed (T₁- 82.49%, T₂-80.65%, T₃- 79.37%, T₄- 77.16%) was less than control cookies (T₀-85.18%) respectively. The carbohydrate content of the black wheat cookies increased with the addition of ragi flour and bajra flour.

Sensory Analysis of Cookies

Table 3: Mean $\pm$ SD scores of sensory evaluations of Cookies

Treatment	Taste	Color	Appearance	Flavor	Texture	After taste/mouth feel	Overall acceptability
Control	7.84 $\pm$ 0.44	8.49 $\pm$ 0.26	8.06 $\pm$ 0.34	8.53 $\pm$ 0.22	8.1 $\pm$ 0.30	8.37 $\pm$ 0.49	7.95 $\pm$ 0.42
T ₁	8.57 $\pm$ 0.21	8.36 $\pm$ 0.34	8.25 $\pm$ 0.51	8.46 $\pm$ 0.31	7.91 $\pm$ 0.57	8.34 $\pm$ 0.38	8.15 $\pm$ 0.52
T ₂	8.04 $\pm$ 0.36	8.44 $\pm$ 0.30	8.34 $\pm$ 0.44	8.52 $\pm$ 0.42	7.91 $\pm$ 0.60	8.38 $\pm$ 0.33	8.01 $\pm$ 0.46
T ₃	8.13 $\pm$ 0.20	7.66 $\pm$ 0.22	8.15 $\pm$ 0.28	7.56 $\pm$ 0.39	7.69 $\pm$ 0.54	7.55 $\pm$ 0.28	8.04 $\pm$ 0.41
T ₄	7.04 $\pm$ 0.24	7.49 $\pm$ 0.24	7.2 $\pm$ 0.17	7.56 $\pm$ 0.18	7.19 $\pm$ 0.39	7.29 $\pm$ 0.61	7.87 $\pm$ 0.34
SE(d)	0.01	0.09	0.12	0.11	0.17	0.15	0.15
CD @ (5%)	0.29	0.26	0.35	0.31	0.47	0.42	0.41

The result of standardized of cookies prepared with the replacement of T₁ (50:5:5), T₂ (40:10:10), T₃ (30:15:15), T₄ (20:20:20 per 100 gm) of black wheat flour incorporated with ragi flour and bajra flour has been presented in table 3. Data related to overall acceptability revealed that the combination T₁ was liked extremely, followed by T₂ and T₃ liked much and T₄ liked moderately it also revealed that among all the treatments, T₁ showed the highest score among all the treatments on the basis of sensory characteristics viz colour (8.36 $\pm$ 0.34), Taste (8.57 $\pm$ 0.21), Texture (7.91 $\pm$ 0.57), Flavour (8.46 $\pm$ 0.31), Appearance (8.25 $\pm$ 0.51), After taste (8.34 $\pm$ 0.38), and overall acceptability (8.15 $\pm$ 0.52), then all counter parts. while T₄ has the least score for all the sensory characters viz, colour (7.49 $\pm$ 0.24), Taste (7.04 $\pm$ 0.24), Texture (7.19 $\pm$ 0.39), Flavour (7.56 $\pm$ 0.18), Appearance (7.2 $\pm$ 0.17), After taste (7.29 $\pm$ 0.61), and overall acceptability (7.87 $\pm$ 0.34).

Data also revealed that decreasing the incorporating of ragi and bajra flour with black wheat flour is resulted in a higher sensory parameters. This could be due to the property of black wheat flour improved the texture and appearance and taste of the cookies.

In term of overall acceptability T₁ was found to be the most preferred treatment among the proposed ones, receiving the highest score for all sensory attributes, followed by control, T₁, T₂, T₃ and T₄. The score was higher than the control sample also for all the products Treatments.

Conclusion

Black wheat is gluten free rich, antioxidant, and anti cancerous, procured for the diseases such as obesity, cardiovascular diseases and good source fortification of iron and zinc. Ragi and Bajra are good source of calcium and protein. For the preparation of cookies a standardised ratio were set to the replacement of regular wheat flour were prepared. On the basis of sensory evaluation and proximate analysis found acceptable and recorded for highest attributes. The good quality of cookies must be prepared by using the millet (ragi and bajra flour), beneficial for good health. The outcomes of the present research study can be high protein, calcium, iron and zinc cookies prefer to malnutrition children & all age groups.

Recommendation

- The therapeutic products can be developed for various diseases as the black wheat flour is rich in fiber.
- Black wheat flour is used in making for various kinds of food products at home and industrial level in place of normal wheat. So the consumption of black wheat flour is good health benefits.
- Millets is low cost cereals but has many health benefits and to make low cost food products for commercial purpose.

Acknowledgement

The authors are highly thankful to the Head of Department of Food Science and Nutrition for help and worthy suggestion.

Conflict of Interest

The authors declare that there are no conflict of interest regarding the publication of this paper.

References:

1. Horwitz W, editor. Official Methods of Analysis of the Association of Official Analytical Chemists. Washington, D.C: Association of Official Analytical Chemists; c1995.
2. Dhua RS, Kumar S, Singh S. Comparative analysis of nutritional components and antioxidant activity of black and yellow wheat varieties. Food Chemistry. 2021;340:127860. doi: 10.1016/j.foodchem.2020.127860.
3. Goyal A, Singh J, Kumar P. Functional properties and health benefits of millet milk in food product development. Journal of Food Science and Technology. 2021;58(5):1936-1945.
4. Jones L, Williams R. The rise of millet production in the United States: Opportunities and challenges. Journal of Sustainable Agriculture. 2021;29(1):55-64. doi: 10.1080/10440046.2020.1786291.
5. Kumar A, Singh A. Millet production and its significance in India: A review. Agricultural Research. 2018;7(4):467-475. doi: 10.1007/s40003-018-0340-6.

6. Kumari P, Zudir A. Black wheat: A new addition to the food basket of India. *Journal of Food Science and Technology*. 2021;58(6):2357-66. doi: 10.1007/s11483-021-01234-7.
7. Soni N, Kulkarni SA, Patel L. Study on development of high protein cookies. *International Journal of Chemical Studies*. 2018;6(6):439-444.
8. Ministry of Health and Family Welfare. National Family Health Survey (NFHS-5), 2020. Government of India; c2020.
9. Oni SA, Ojo TA, Adesina JO. Millet production in West Africa: A focus on Nigeria and Burkina Faso. *African Journal of Agricultural Research*. 2020;10(2):72-85. doi: 10.5897/AJA2020.0925.
10. Rashmi, Mogra MM, Kanno J. Physical properties and nutritional composition of black wheat for development of value-added products. *The Pharma Innovation Journal*. 2022;11(9):2349.
11. Wang Y, Zhang X, Zhao L. Millet cultivation in China: Trends and perspectives. *Journal of Agricultural Sciences*. 2019;12(3):125-134. doi: 10.1080/0972089X.2019.157231.