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Culinary Alchemy: Crafting Jaggery Coconut-Infused Delights and Healthful Black Rice Ladoo

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Abstract: The main objective of this project was to create black rice ladoos. Research findings indicate that black rice contains a range of phytochemical variations, such as anthocyanin and oryzonal, which may contribute to its functional properties as a nutritious food. Black rice ladoos are prepared for various purposes, including cultural events, festivals, and simply as a delicious and healthy treat. Black rice, also known as forbidden rice, is rich in antioxidants, vitamins, and minerals. Its unique flavor and nutritional advantages have made it a popular ingredient in traditional desserts like ladoos. Black rice is abundant in carbohydrates, proteins, and iron. To evaluate the overall benefits of black rice ladoos, several analyses were conducted, including assessments of composition, antioxidant activity, color, texture, and sensory quality. These ladoos are high in protein, fat, and carbohydrates, providing a significant amount of energy. However, the black rice ladoo that I produced is simple to eat, tasty, and enjoyable. It's easy-to-bite and chew nature makes it excellent for senior persons and little toddlers. As a medicine, we can have black rice ladoo. It treats a variety of issues, including skin problems, an increase in haemoglobin, and cancer.

Key Words: Black Rice, Anthocyanin, Antioxidant, Oryzonal, Metabolities

1. Introduction

Black rice ladoo are a wonderful and nutritious treat, especially with the addition of dried dates, shredded coconut, ghee, garden cress seeds, and cinnamon. The functional ingredients incorporated serve a specific purpose, making these ladoos more than just a tasty treat but also a potential aid for breastfeeding moms by stimulating breast milk production. Their high fibre and vitamin content boosts their nutritional value even further. The food product development course in the third year of undergraduate studies resulted in the design and sensory evaluation of a variety of goods, including oats papad, brown rice nankhatai, brown rice khakra, curry leaves chutney, and ladoo. Among them, the Nutritious Ladoo was chosen based on consumer acceptability and sensory testing, and it is specifically meant to help nursing women by improving breast milk production. The ladoo is made of kharak, dried coconut, dink, jaggery, and garden cress seeds. A key component, dried kharak, is a rich source of energy and nutrients, helping to increased lactation and overall health for new moms. The Nutritious Ladoo has a variety of vital ingredients. Dried dates contain vitamins, fibre, fat, protein, minerals, calcium, magnesium, and iron, as well as a decreased sugar level, making them acceptable for diabetics. Garden cress seeds, which are classified as functional foods, help to enhance milk production during breastfeeding. They are also a good source of energy, protein, lipids, iron, calcium, and phosphorus. Because of this combination, the ladoo is a nutritionally dense and well-rounded meal. Based on consumer acceptance, standardize a creative and cost-effective nutritional product. Sensory evaluation can be used to determine the product's shelf life. Create a unique label for the goods. Investigate your packing alternatives. Understand budgeting, marketing, and entrepreneurship in relation to the developed product.

Black rice that is black in Asian societies, particularly in China, Korea, and Japan, black rice has a long history. Its stronger antioxidant activity than white rice makes it a more nutritious choice. Black rice eating has historically been restricted to royals and elite persons, reflecting its perceived exclusivity and importance as a tribute dish throughout imperial periods in China and Indonesia. It's fascinating to learn about the rich history of black rice, sometimes known as forbidden rice, and how it was highly regarded for its purported health benefits. The distribution of black rice resources across countries, particularly China (62%), emphasizes its worldwide relevance. The creation of several cultivars, including 52 high-yielding ones,

demonstrates continued efforts to improve agriculture.[1]The variety in pigmentation, nutritional content, and phyto-chemical properties of black (purple) rice within the *Oryza sativa L.* species, particularly in the indica and tropical japonica/javanica subspecies from Indonesia, contributes to its distinct health benefits. Black glutinous rice stands out among black rice varieties because to its legendary popularity for multiple health advantages. While anthocyanin is a significant bioactive ingredient, black rice is not as widely consumed as white or red rice. By focusing on Indonesian cultivars, this review aims to fill a knowledge gap in black rice research.[2] The study sought to identify anthocyanin ingredients in Purple black rice No. 6 and to evaluate the antioxidant potential of black rice pigment (BRP). The crude extract was isolated and purified using silica gel thin layer chromatography. Various spectroscopic techniques were used to characterize anthocyanins. The study used various systems to evaluate BRP's free radical scavenging ability and total reducing ability, concluding that cyanidin-3-glucoside is the primary component with significant scavenging capacity across various radicals, with higher pigment concentrations demonstrating increased efficacy.[3]Coconut, derived from the coconut palm (Cocos nucifera), is widely consumed worldwide. Coconut oil is refined from the dried fruit's endosperm for commercial use, but virgin coconut oil is produced without the use of chemicals, implying potential health benefits. The oil contains a high concentration of saturated fatty acids, primarily lauric acid (C12:0), which accounts for approximately 50-55% of the total fatty acids. It also contains medium-chain fatty acids (MCFAs), which are easily converted to energy in the body, such as caproic acid (C6:0), caprylic acid (C8:0), capric acid (C10:0), and lauric acid (C12:0). It is high in antioxidants such herols, sterols, and carotenoids. Because of its particular fatty acid composition and other components, coconut oil is a versatile product with multiple health benefits and culinary applications. Coconuts' numerous usage in India emphasise their cultural, culinary, and economic importance. The composition of coconut husks, which contains cellulose, lignin, and other components, highlights their potential for a variety of applications. Copra extraction and value-added product production both contribute significantly to its utilisation. Furthermore, the high lignin and cellulose content of coconut husks and fibres makes them significant resources.[5]

2.Material and Methods

This prospective comparative project was carried out at Department of Food Technology Ballarpur Institute of Technology, Ballarpur, Chandrapur, India from November 2022 to November 2023.

Study Design: Product development with various material compositions and evaluation of product for sensory analysis.
Study Location: Department of Food Technology Ballarpur Institute of Technology, Ballarpur, Chandpur, India
Study Duration: November 2022 to November 2023.

2.1. Methodology for Preparation of Black Rice ladoo:

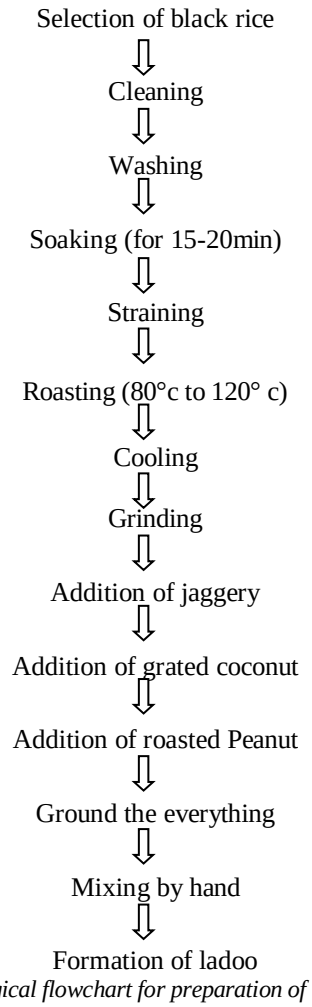


Fig.1 Technological flowchart for preparation of black rice ladoo

a. Raw material selection: Take 50 gm of raw black rice. For the creation of black rice ladoo, use high-quality coloured black rice. Organic rice should be used.
b. Cleaning: Thoroughly clean the black rice, as stone or undesirable material may be present. Remove any undesirable stuff from the black rice.
c. Washing: Wash the rice twice with water to eliminate any dust or dirt. The black rice should then soak in water for 15 to 20 minutes to absorb the water.
d. Straining: Use a strainer to drain the water; eliminating the water aids in the roasting process.
e. Roasting: Roast the black rice over medium heat until it puffs up.
f. Grinding: Grind the roasted black rice into a fine powder, then add the jaggery and grind it again to ensure appropriate blending.
g. Mixing: Combine all of the ingredients evenly. In the mixer jar.
h. Forming: Form ladoo's in round shape by hand.

2.2. Microbial analysis of black rice ladoo

Requirement:

Microscope, weighing machine, petridish, test tube, test tube stands, conical flask, beaker, pipette, micro pipette, micro tips, tripode stand, measuring cylinder, cotton, aluminium foil.

Chemicals:

Nutrient Agar, EMB Agar, MacConkey Agar, Malt Extract Agar, Tryptone Broth, Gram Iodine, Gram Crystal Violet, Gram decolourizer, Gram Safranine.

Isolation of microorganisms from sample:

Black rice laddu samples were serially diluted for microbiological investigation. The standard procedure was used for serial dilution. Six test tubes were used to dilute the sample with distilled water. Microbial analysis was performed on the last three dilutions. For microbiological analysis, basal media and several selective media were used. The microbial investigation of a given food sample involved testing for the presence of various bacteria, utilizing a range of specialized media to cater to different microbial needs. Nutrient agar, a basal or general-purpose medium, was employed for cultivating non-fastidious microorganisms with no specific dietary requirements. This medium aimed to identify common types of bacteria within the sample. Malt Extract Agar, a nutrient-rich medium, served the purpose of isolating and enumerating a diverse range of yeasts and molds from the food sample, enabling the screening of different yeast and mold strains. MacConkey Agar, a selective and differential bacterial culture medium, played a crucial role in isolating and distinguishing Gram-negative and enteric bacteria based on lactose fermentation, thereby screening for such bacteria in the food sample.

Additionally, Tryptone broth was utilized for identifying indole-generating bacteria, as certain bacteria can degrade the amino acid tryptophan into indole, which accumulates in the media. This medium facilitated the screening for different indole-generating bacteria in the food sample. Eosin-methylene blue (EMB) Agar, selective for gram-negative bacteria, particularly coliforms and fecal coliforms, was employed to isolate and differentiate distinct gram-negative and enteric bacilli. EMB Agar allowed screening for various gram-negative bacteria in the food sample. Microbial growth was monitored 24 hours after incubation in a controlled environment, providing valuable insights into the composition and characteristics of microorganisms present in the tested food sample.

3. Results

3.1. Morphological Analysis of microbes:

The outcomes of the simple staining procedure are presented herein. Detailed results pertaining to the staining technique, including observations on cell morphology, structural identification, and any pertinent data, shall be systematically elucidated for comprehensive scientific analysis. The findings from the differential staining protocol are hereby disclosed. This encompasses a thorough documentation of the results derived from the staining process, encompassing distinctive observations related to cellular morphology, structural identification, and any pertinent data. The systematic presentation is tailored to facilitate a comprehensive scientific scrutiny of the outcomes obtained through differential staining.

Fungi (Yeast and mould):

No growth was seen on meat extract media, indicating the absence of fungi (yeast and mould) in the supplied dietary sample. As a result, no morphological analysis of fungus was undertaken.

Microbial analysis result of black rice ladoo:

The analyzed food sample demonstrated the presence of diverse bacterial populations, encompassing distinct Gram-positive and Gram-negative bacterial strains. Notably, the absence of fungi, including yeast and mold species, was confirmed within the examined food sample. The assessment revealed the existence of bacteria capable of lactose fermentation, as well as the identification of Enteric bacteria in the given food sample. The investigation identified the occurrence of various bacteria proficient in the production of indole, indicative of their ability to degrade the amino acid tryptophan. Remarkably, the absence of Coliforms and Fecal Coliforms was conclusively established in the analyzed food sample through rigorous microbial scrutiny.

Table 1. Simple staining

Sr.no.	Media	Results of staining
1	**Nutrient Agar**	Methylene blue was used to stain bacteria identified on these media, which were then examined for morphological characteristics. Bacterial cells in the rod shape (Bacillus) and circular shape (Coccus) were detected. Various bacterial cell configurations were discovered.
2	**MacConkey Agar**	Bacterial growth was detected using simple staining, and a mixture of round or circular (Coccus) and rod (Bacillus) shapes were discovered. There were a lot of rod-shaped microorganisms.
3	**Tryptone broth**	Simple staining was used to observe bacterial growth. With colonies of rod shape bacteria, circular or round shape bacteria were common.

Table 2. Differential staining

Sr. No.	Media	Results of staining
1	**Nutrient Agar**	Gram staining was used to identify bacteria on this media. A sample of colonies was chosen at random and observed. **Gram positive** bacteria were detected in certain colonies, while **Gram negative** bacteria were found in others.
2	**MacConkey Agar**	Gram staining was used to identify **Gram Negative** bacterial colonies detected on these plates.
3	**Tryptone broth**	Gram staining was used to identify **Gram Negative** bacterial colonies detected on these plates.

The results were shown in following table.

Sr. no.	Charecterisation	Result
1	Gram positive and gram negative bacteria	Present
2	Fungi(Yeast and Mold)	Absent
3	LactosefermenterbacteriaandEntericbacteria	Present
4	Indoleproducingbacteria	Present
5	ColiformsandFecalColiforms	Absent

3.2 Proximate Analysis Result of Black Rice Ladoo.

In proximate analysis Moisture content and total Ash content were determined. The result of proximate analysis are given in following table.

Factors/Parameters (%)	Sample of Black Rice Ladoo
Moisture Content	04%
Total Ash Content	1.58%

3.2.1 Moisture Content

As shown in table The Moisture content of Black Rice Ladoo was found to be 4%. Which was compared to black rice moisture content is 9.3%.

3.2.2. Ash Content

Total Ash Content of black rice ladoo was found to 1.58% and it was compared with Ash content of black rice is 3.1%.

3.3 Sensory and other analysis

The experiment was conducted for "Sensory evaluation and Nutritional analysis of value added Laddu Prepared from Black rice" The present investigation was undertaken to evaluate the acceptability and nutritional content of value added Ladoo.

Table 3: Average sensory scores of Control and experimental Sample of Value-added Ladoo

Control and Treatments	Taste	Appearance	Aroma	Mouth Feel	Color	Overall Acceptability
Trial 1	8.2	8.7	8.7	7.8	8.5	8.2
Trial 2	8	8.3	7.8	7.6	8	7.8

Trial 3	8.1	8.1	8.8	8.6	8.6	8.3
Trial 4	8.1	8.3	8.8	8.6	8.6	8.5
Trial 5	8.5	8.3	8.8	8.6	8.6	8.6

The above table no. 3 shows that average sensory score of value-added Laddu on the basis of sensory parameters, i.e. Taste, Appearance, Aroma, Mouth feel, Color and Overall acceptability. The Taste of the Value-added Ladoo indicate that T5 had highest score is 8.5 followed by T1(8.2) T3(8.1) T4(8.1) and T2(8) respectively. Roasted Black rice and Peanut, Jaggery, Cardamom and coconut gave Sweet Taste to the Ladoo.

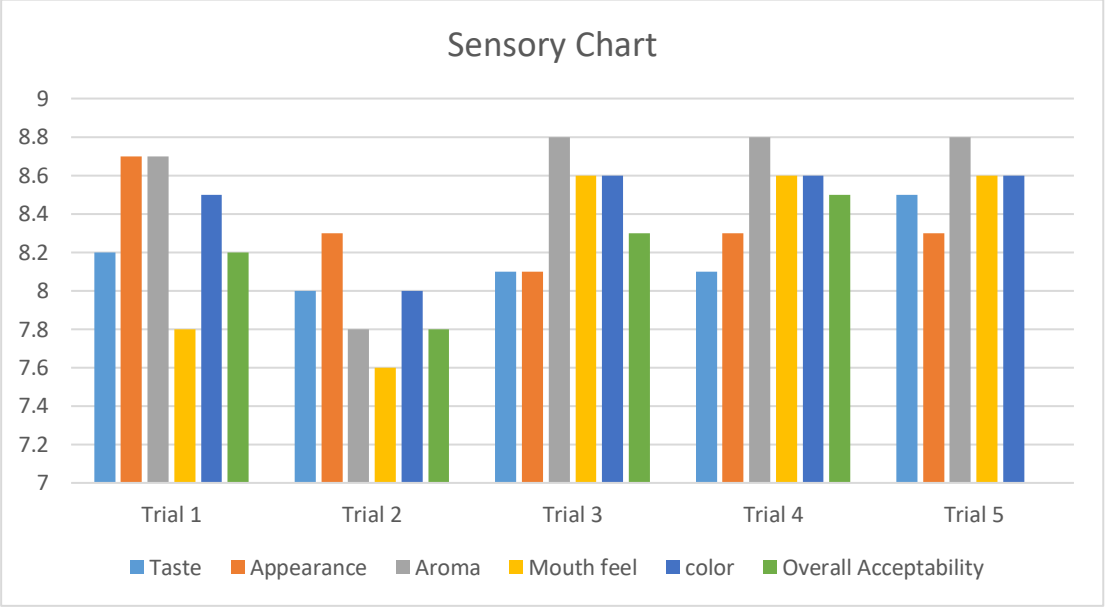
The appearance T1 had the highest score 8.7 followed by T2(8.3) T4(8.3) T5(8.3) and T3(8.1) respectively. Roasted Black rice granule flour to gave Black and White color.

A result of sensory evaluation of value-added Laddu by using 9 point hedonic scale shows that Aroma T3 T4 and T5 had the highest score 8.88 followed by T1 (8.7) and T2 (7.8) respectively. Roasted Black rice ladoo gave Black and White colour to value-added "Laddu".

The mouth feel T3 T4 and T5 had highest score 8.6 followed by T1 (7.8) and T2 (7.6) respectively. Black rice flour is a little course, so the ladoo feels little crunchy.

Color T3 T4 and T5 had highest score 8.6 followed by T1(8.5) and T2(8) respectively. Roasted Black rice granule flour to gave Black and White color.

The sensory score of Overall acceptability of value-added "Laddu" treatment T5 had highest score 8.6 followed by T4(8.5) T3(8.3) T1(8.2) and T2(7.8) respectively. The amount of best treatment T5 had ratio of Black rice + Jaggery + Peanut + Grated Coconut + Cardamom 44: 40 : 10 : 5 : 1 respectively.



4.Discussion

One notable aspect of the ladoo is its positive impact on heart health. The combination of black rice, jaggery, and other ingredients contributes to this benefit. Additionally, the ladoo is recognized for its ability to aid in body detoxification, making it a potentially valuable addition to a healthy lifestyle. Its suitability for gluten-free diets adds to its appeal, catering to individuals with gluten sensitivities or those following gluten-free eating patterns.

The support for weight management is another noteworthy advantage attributed to the black rice ladoo. Its nutrient composition, along with the inclusion of peanuts, can contribute to satiety and potentially assist in weight-related goals. Furthermore, the ladoo's potential role in iron replacement therapy is significant, especially for individuals with iron deficiency. The study also suggests a preventive aspect, indicating that the black rice ladoo may play a role in cancer prevention. The anti-diabetic and anti-inflammatory properties further underline its potential health benefits. Additionally, the positive impact on skin health adds to its overall appeal as a nutritious and wholesome food option.

Incorporating black rice ladoo into one's diet could offer a tasty and nutritionally rich option with potential health advantages. While it can be beneficial for a broad audience due to its nutrient profile, its targeted recommendations for specific health conditions make it particularly noteworthy for individuals with those concerns. However, further research and validation are essential to solidify these findings and better understand the long-term impacts and optimal consumption patterns of black rice ladoo for various health objectives. The microbial analysis conducted on the black rice ladoo is an essential step in ensuring the safety and quality of the food product. The isolation and culturing of microorganisms from the food sample provide valuable insights into the potential presence of harmful bacteria that could pose health risks. The use of different media allows for the selective growth of specific microorganisms, aiding in the identification process.

Examining the morphological characteristics of the isolated bacteria through simple staining techniques is a fundamental aspect of microbiological analysis. These techniques, which involve the use of dyes like Methylene blue, crystal violet, nigrosin, and congo-red, help in observing key features such as size, shape, and bacterial cell configurations. This information

is crucial for understanding the nature of the microorganisms present in the food sample.

The application of Gram staining, a differential staining method, further refines the analysis by distinguishing between Gram-positive and Gram-negative bacteria. This classification is based on differences in cell wall composition and structure. The use of primary and secondary stains (Crystal Violet and Safranine) aids in this differentiation. The Gram staining results provide additional insights into the microbial composition of the black rice ladoo, offering a more detailed understanding of the types of bacteria present.

Transitioning to the nutritional analysis of the black rice ladoo, the findings emphasize its richness in essential nutrients such as fiber, calcium, vitamins, iron, and minerals. This nutritional profile positions the ladoo as a versatile and wholesome option suitable for individuals across various age groups. The specific recommendation for individuals with health conditions, including diabetes, cancer, heart disease, asthma, and liver infections, underscores the potential therapeutic benefits associated with consuming this food product.

In conclusion, the integration of microbial analysis with nutritional findings ensures a comprehensive understanding of the black rice ladoo. The detailed examination of microorganisms provides insights into food safety, while the nutritional analysis highlights its potential health benefits. This combined approach contributes to the overall assessment of the black rice ladoo as a safe, nutritious, and potentially therapeutic food option for a diverse range of consumers.

5.Conclusion

The resulting black rice ladoo is rich in essential nutrients such as fiber, calcium, vitamins, iron, and minerals, making it suitable for various age groups. It is particularly recommended for individuals with health conditions like diabetes, cancer, heart disease, asthma, and liver infections. The ladoo offers several health benefits, including heart health protection, body detoxification, suitability for gluten-free diets, support for weight management, assistance in iron replacement therapy, cancer prevention, anti-diabetic and anti-inflammatory properties, and benefits for skin health. The study suggests that incorporating black rice ladoo into one's diet can provide a tasty and nutritious option with potential health advantages, especially for those with specific health concerns.

References

1. *Taku A, Tzudir L, Kumari S, Nongmaithem D. Weed management strategies in summer black gram (Vigna mungo L. Hepper) grown in sandy loam soils of western Nagaland. InBiological Forum–An International Journal 2023 (Vol. 15, No. 2, pp. 719-23).*
2. *Pratiwi R, Purwestri YA. Black rice as a functional food in Indonesia. Functional Foods in Health and Disease. 2017 Mar 31;7(3):182-94.*
3. *Tai L, Huang S, Zhao Z, Huang G. Chemical composition analysis and antioxidant activity of black rice pigment. Chemical Biology & Drug Design. 2021 Mar;97(3):711-20.*
4. *Panda DK, Jyotirmayee B, Mahalik G. Black rice: A review from its history to chemical makeup to health advantages, nutritional properties and dietary uses. Plant Science Today. 2022 Aug 31;9(sp3):01-15.*
5. *Elevitch C. Species profiles for Pacific Island agroforestry. Permanent Agriculture Resources series. Western Region Sustainable Agriculture Research and Education, Holualoa, Hawaii. 2006.*
6. *Venugopal A, Joseph D. Cocos nucifera: It's pharmacological activities. World Journal of Pharmaceutical Sciences. 2017 Aug 1:195-200.*
7. *Jadav KD, Mehta BM. Cardamom: Chemistry, medicinal properties, applications in dairy and food industry: A review. Research and Reviews: Journal of Dairy Science and Technology. 2018;7(3):9-19.*
8. *Kumar S, Kumari R. Traditional, Phytochemical and Biological activities of Elettaria cardamomum (L.) Maton–A review. Int. J. Pharmaceut. Sci. Res. 2021; 12:2320-5148.*
9. *Singh J, Solomon S, Kumar D. Manufacturing jaggery, a product of sugarcane, as health food. Agrotechnol S11. 2013;7(2).*
10. *Jagannadha Rao PV, Das M, Das SK. Jaggery-A Traditional Indian sweetener. Indian Journal of Traditional Knowledge. 2007;6(1):95-102.*
11. *Rao GP, Singh P. Value addition and fortification in non-centrifugal sugar (jaggery): a potential source of functional and nutraceutical foods. Sugar Tech. 2022 Apr;24(2):387-96.*
12. *Moharana A, Lenka B, Singh AP, Kumar NK, Nagaraju B, Das SR. Peanut as a food source: A review. Journal of Pharmacognosy and Phytochemistry. 2020;9(6):225-32.*
13. *Kyei SK, Akaranta O, Darko G. Synthesis, characterization and antimicrobial activity of peanut skin extract-azo-compounds. Scientific African. 2020 Jul 1;8: e00406*
14. *Ranganna, S., 1986. Handbook of Analysis and Quality Control for Fruit and Vegetable Products Tata McGraw-Hill Education, 1986 - Food.*