



E-ISSN: 2709-9385

P-ISSN: 2709-9377

JCRFS 2024; 5(1): 162-165

© 2024 JCRFS

www.foodresearchjournal.com

Received: 05-03-2024

Accepted: 08-04-2024

Abdul Gufran Abdul GafoorM.Tech, Department of
Agricultural Engineering,
Maharashtra Institute of
Technology, Aurangabad,
Maharashtra, India**Dr. DT Bornare**Ph.D. Scholar, H.O.D and
Associate Professor at MIT
Aurangabad, Department of
Agricultural Engineering
Maharashtra Institute of
Technology, Aurangabad,
Maharashtra, India**Dr. SG Jaiswal**Ph.D. Scholar, Assistant
Professor at Maharashtra
Institute of Technology,
Aurangabad, Department of
Agricultural Engineering,
Aurangabad, Maharashtra,
India**Correspondence****Abdul Gufran Abdul Gafoor**M.Tech, Department of
Agricultural Engineering,
Maharashtra Institute of
Technology, Aurangabad,
Maharashtra, India

Review on development of idli pre-mix by incorporation of black cumin seeds (Kalonji Seeds)

Abdul Gufran Abdul Gafoor, Dr. DT Bornare and Dr. SG Jaiswal

DOI: <https://doi.org/10.22271/foodsci.2024.v5.i1c.141>

Abstract

Fermented foods and beverages have been part of daily diets for centuries. People worldwide produce fermented foods and drinks through either spontaneous fermentation or by adding starter cultures, using their knowledge of locally available raw materials from plant or animal sources. Microorganisms involved in fermentation transform these raw materials nutritionally and biochemically, infusing taste, texture, and aroma into the products. Fermented foods can be produced and consumed in various ways depending on cultural and ethnic practices. While most fermented foods are known for their health-promoting benefits, their global consumption is declining due to globalization and food transition.

Some of the most widely consumed fermented foods in India include idli, dosa, appam, porridge (koozh), dhokla, gundruk, dahi, sinki, rumba, fermented rai, kanji ka, and handua. Fermented foods were popular due to their prolonged shelf life through acetic acid and alkaline fermentations. The fermentation of food contributes to the biological enrichment of protein, essential amino acids, essential fatty acids, and vitamins, while also destroying anti-nutrients. The fermentation process improves the flavor and aroma of the foods, increases digestibility, and exerts health-promoting benefits.

Keywords: Fermented food, traditional, cereals, and pulses, breakfast food, digestibility, low fat content, essential amino acid, vitamin and minerals content

1. Introduction

Idli is a popular fermented breakfast food, particularly enjoyed in Southern India and Sri Lanka, valued for its texture and sensory qualities. It is made by steaming a batter of rice (*Oryza sativa*) and black gram (*Phaseolus mungo*) in a 4:1 ratio. The fermentation of rice and black gram dhal is crucial for the quality of the final product. The fermentation time is a key factor that influences the sensory attributes and nutritional quality of idli, affecting both its flavor and texture. Consuming a combination of cereals and legumes, like in idli, is nutritionally beneficial due to the balanced intake of carbohydrates and proteins. Although India's diverse population has created a wide variety of traditional fermented foods using cereals and legumes, idli stands out as a fermented product that offers a higher protein efficiency ratio (PER) and increased levels of essential amino acids and vitamins.

1.1 Idli

Idli, a traditional and popular fermented breakfast food in India and other countries, is made from a batter of fermented black gram and rice. It is an important dietary source of protein, calories, and vitamins. Once cooked, idli is soft and spongy, making them easy to digest and nutritionally valuable (Adsare *et al.*, 2022) [2].

Idli, known for its nutritional benefits, combines black gram dal and rice, providing a healthy balance of proteins and carbohydrates. The traditional preparation involves soaking the ingredients, grinding them, and fermenting the batter overnight. During fermentation, microorganisms proliferate rapidly, outnumbering initial contaminants (L. Roy *et al.*, 2023) [3]. While the traditional preparation of idli is elaborate, the demand for convenience has led to the popularity of readymade wet idli batters and instant mixes in Indian markets. Various brands and local suppliers offer idli and dosa batter. To manage price differences, some manufacturers reduce the proportion of black gram dal, increase the amount of parboiled rice, or mix in other rice varieties such as raw rice and mixed rice. However, these practices may not be well-received by consumers.

Although variations in the batter ratio may not be harmful, increased starch from rice and diluted protein content from dal can affect the taste and texture of idlis. Currently, there is no method to quantify the exact proportions of parboiled rice and black gram dal used in the batter (L. Roy *et al.*, 2023) [3].

1.2 Rice

Rice (*Oryza sativa*) is among the oldest cultivated crops, with historical references dating back to 2800 BC in China. It serves as a staple food and is a primary dietary component for a significant portion of the global population, particularly in Southern and Eastern Asia. Rice accounts for more than one-fifth of the calories consumed worldwide by humans. Its composition includes approximately 7.37% protein, 2.2% fat, 64.3% available carbohydrates, 0.8% fiber, and 1.4% ash content (Mahmoud *et al.*, 2022) [4]. While there are numerous rice varieties, such as long grain, Basmati, and Arborio, only a few are extensively cultivated. In India, around 85% of the rough rice produced is processed into edible rice, with total production estimated at 1186.9 MT for the 2022-23 period. About 10% of rough rice is used for making rice products like puffed rice and flaked rice, and roughly 5% is reserved as seed for the next crop. Milling methods range from traditional hand pounding and dehusking pedals in remote Asian regions to modern equipment in developing countries (Mahmoud *et al.*, 2022) [4]. Rice is a nutritious food source, low in fat and rich in starchy carbohydrates, and it is packed with essential vitamins and minerals, including vitamin E, B vitamins (thiamin, niacin), and potassium.

1.3 Black gram

Black gram (*Phaseolus mungo*) or urad is one of the important pulse crops in India. India is the largest producer and consumer of Black gram in the world. It contains about 26% protein which is almost three times that of cereals. Black gram supplies a major share of protein requirement of vegetarian population of the country. It is being grown over an area of 2.42 mega hectare with an annual production of 0.77 mega tonnes with productivity of 324 kg/hectare in the country. In India the total production of black gram is 123.6 MT in 2022-23. It belongs to family *Leguminosae*. Black gram is one of the important pulse crops in India. It is reported to be originated in India. Its references have also been found in Vedic texts such as Kautilya's 'Arthashastra' and in 'Charak Samhita' lends support to the presumption of its origin in India.

India is the world's largest producer and consumer of black gram, a vital pulse crop with a unique role in Indian agriculture. It ranks fourth in production and acreage among pulses in the country. Black gram is a significant source of protein for India's vegetarian population. It is consumed both as split and whole pulses, serving as a crucial supplement to a cereal-based diet. Common dietary combinations like dal chawal (pulse-rice) and dal roti (pulse-wheat bread) are staples in the average Indian diet. The nutritional value of wheat or rice increases considerably when paired with black gram due to the complementary essential amino acids such as arginine, leucine, lysine, isoleucine, valine, and phenylalanine.

1.4 Black Cumin

Hazrat Aisha (R.A) has narrated that she heard the Prophet

(PBUH) Saying, 'This black cumin is healing for all diseases except As-Sam.' Aisha said, 'What is As-Sam?' He said, 'Death.' (Sahih Al-Bukhari, 5687).

Nigella sativa L., commonly known as black cumin seed or black seed, is an annual herb belonging to the Ranunculaceae family. Indigenous to Southwest Asia, North Africa, and Southern Europe, this plant is also cultivated in numerous Mediterranean and Middle Eastern countries, including Iran, Pakistan, India, Saudi Arabia, Syria, and Turkey. Both the plant and its seeds are widely utilized as an edible herb and spice, and they have significant medicinal uses. Black seed oil, in particular, is extensively employed in traditional medicine to address conditions such as rheumatism, piles, jaundice, dyspepsia, parasitic infestations, and skin ailments. Research, predominantly on animals, suggests that the oil possesses antihypertensive, antidiabetic, antimicrobial, anticancer, diuretic, analgesic, anti-inflammatory, and antioxidant properties.

The Study Shows That the seeds and oil of *N. sativa* are greatly used in treating different diseases and ailments. In Islamic literature, our beloved Prophet Muhammad, has recommended it in many ailments due to its healing properties, hence, is advised to use it on regular basis. It has different names such as seeds of blessing, black cumin, black seed, Al-Habba Al-Sauda, Al-Habba Al-Barakah, Siyahdaneh and Kalonji. The seeds are found all over the world, especially in the Middle East. *N. sativa* contains some chief constituents such as thymoquinone (TQ), dithymoquinone (DTQ), thymol-hydroquinone (THQ), and thymol (THY); p-cymene, 4-terpineol, and t-anethol. Its most essential component i.e., thymoquinone has remarkably proved its activity as hepatoprotective, anti-inflammatory, antioxidant, cytotoxic and anti-cancer agents or properties.

2. Literature Review

2.1 An overview of idli and significance of idli as a breakfast food

Idli is a white, fermented an acid leavened, steamed, soft and spongy texture product, commonly popular and consumed in the entire South India. It has been documented that idli batter fermentation has been in use since 1100 AD. Idli and dosa are commonly consumed breakfast foods in India and Sri Lanka. Idli is prepared from naturally fermented batter made from washed and soaked milled rice (*Oryza sativus*) and dehulled black gram dhal (*Phaseolus mungo*) (Anika Shaikh 2021) [7].

From a nutritional point of view, it is beneficial to consume mixtures of cereals and legumes because this enhances the balance of carbohydrates and proteins as well as dietary essential amino acids. Acidified and 4 leavened foods like Indian idli, dosa and dhokla comes under an interesting group of products made from cereal-legume mixtures. Being a cereal and legume-based fermented product, idli has an improved nutritional composition due to a higher protein efficiency ratio and increased essential amino acid and vitamin contents.

2.2 Importance of fermentation in idli

The fermentation of idli batter was carried out at an ambient temperature of 25-30 °C, which is the optimum for a desirable fermentation (L Roy, 2023) [3].

The microorganisms responsible for the characteristic changes in the batter have been isolated and identified.

Though there is a progressive change in the bacterial flora, the predominant microorganism responsible for souring and gas production was found to be *Leuconostoc mesenteroides*. In the later stages of fermentation, growth of *Streptococcus faecalis* and followed by *Pediococcus cerevisiae* became significant. The fermentation of idli proves that the leavening action caused by the activity of the hetero fermentative lactic acid bacterium, *L. mesenteroides*. It was established that the lactic acid plays a major role in the fermentation of idli batter.

2.3 Process optimisation

Fermented foods are the important components of the diets of many parts of the world since time immemorial due to its benefits in providing high nutritive value, better organoleptic characteristics, shorter cooking time, prolonged shelf life and enhancement of flavor and aroma in foods. Most of the fermented foods in India are region specific and carried out at the house hold scale using unique preparation methods. The Authour found that the ready-to-reconstitute idlis prepared from the optimized ground batter of black gram and parboiled rice grits (1:4) were dried by using various technologies *viz.* Cabinet drying (CD), fluidized bed drying (FBD) and microwave drying (MD) and packed in polypropylene (PP), metallised polyester (MP) films, stored at ambient (15-34°C) and 37° C temperature conditions. These drying methods has significantly ($p \leq 0.05$) affected the chemical stability, texture and colour of the idlis on storage. FBD idlis showed better chemical stability followed by CD and MD idlis. MD idlis showed slightly more browning and hardness initially as well as during storage as compared to idlis dried by other methods. Idlis dried by all the three methods exhibited a shelf life of 12 months irrespective of the packaging material used and temperature of storage except MD idlis, which showed 9 months stability at 37° C. Microstructural studies revealed comparatively large open pores in MD idlis with better rehydration characteristics (Muskan Shaikh *et al.*, 2021)^[7].

2.4 Nutritional Importance of black cumin

Fermentation is an elemental part in idli as it improves the nutritional quality and organoleptic value. The preparation and fermentation process totally transforms the final quality of idli with improved flavor and texture, concurrently with enhanced digestibility. Nutritionally idli is composed of carbohydrates, proteins, vitamins and minerals. In the literature the nutritional composition and the quality of idli differed due to the utilization of an altered proportions and variety of the rice and black gram (Anika Shaikh *et al.* 2021)^[7].

Rice is the major source of carbohydrates and additionally black gram contributes oligosaccharides (indigestible sugars)-raffinose, stachyose and verbascose in idli.

These oligosaccharides are known to cause flatulence (intestinal gas production) and often elimination of these sugars is considered to be a challenging problem. The process (soaking, fermentation and steam cooking) of idli preparation was beneficial as it reduced the oligosaccharide content up to 34%. Besides, when steamed idli was administered to rats at 50% basal diet, the lower flatulence rate was reported. As a fermentable substrate, these indigestible sugars possessed to have prebiotic properties that support the LAB proliferation as a carbon source (El Sayed A Mahmoud *et al.* 2022)^[4].

2.5 Value addition in Idli

The co-fermentation of finger millet with horse gram was carried out to produce inexpensive protein-rich food (dosa- an Indian breakfast food). Natural fermentation of finger millet-horse gram flour blend in different proportions (2:1, 3:1, 4:1 and 5:1) was performed for 24h. Biochemical analysis showed reasonable drop in pH (6.6-4.2) and starch content (25.52%) with considerable augment in titratable acidity (0.168-1.046%), soluble proteins (1.1-fold) and free amino acids (2.6-fold) at 16h. Lactic acid bacteria conquered yeast counts throughout the fermentation conveyed by a decrease in total soluble and reducing sugars. Total essential amino acids increased 1.1-fold 16 at 16-h fermentation with protein containing 48.68% of essential amino acids over total amino acids. Lysine increased from 5.87 to 6.73 g of amino acid/100 g of total amino acids. Dosa, prepared from 16-h fermented batter, showed better sensory attributes for 4:1 ratio. The formulated new product might be used to overcome the protein-energy malnutrition problems.

The standardized and organoleptically evaluated freshly blanched leaves of the drumstick tree (*Moringa oleifera*) incorporated into three recipes commonly consumed in India such as mung (*Phaseolus aureus*), kabuli chana (*Cicer arietinum*) and desi chana (*Cicer arietinum*). About 20g of leaves were incorporated in 30g of the food products. These recipes were acceptable with an overall composite score ranging from 3.06-3.53 (on a scale of 1 to 5). It was already known that drumstick leaves were rich in micronutrients and was found that these recipes would still meet 82.5% to 83.3% of the RDA for adult women. Hence this study might be a useful effort for the industrial production of ready-to-eat foods incorporating drumstick leaves.

3. Role of Ingredients used in Idli Pre-Mix

The carbohydrate-rich foods like cereals contributed to the Asian Indian diet as a typical source of energy. The most popular fermented product like idli made from rice and black gram which having soft spongy texture widely disbursed in the Indian subcontinent. These are the best combination of cereals and legumes which could offer balance of carbohydrate and proteins in the diet. Apart from the basic nutrients, after fermentation of cereal-legume based product delivers probiotics, prebiotics which carry fermentable sugar, and hydrolytic enzymes, etc. are health promoting.

4. Conclusion

Idli, a staple fermented breakfast food in Southern India and Sri Lanka, is cherished for its texture and taste. Made by steaming a batter of rice and black gram, the fermentation process significantly influences its sensory and nutritional quality. This process enhances idli's flavor and texture while improving its nutritional profile, making it a balanced source of carbohydrates and proteins. Variations in ingredient ratios and preparation methods impact the final product's quality. Despite changes in traditional recipes to cater to convenience, idli remains a nutritionally beneficial food with a high protein efficiency ratio and essential amino acids.

5. References

1. Sonia, Varsha R, Sindhu SC, Neha. Development and nutritional evaluation of curry leaves supplemented Idli.

- The Pharma Innovation Journal. 2022;11(2):620-623.
2. Adsare AD, Shinde EM, Patil AA, Gajmal DB. Development and quality evaluation of Multigrains Idli. The Pharma Innovation Journal. 2022;SP-11(11):725-728.
 3. Roy L, Reshmi SK, Moses JA, Anandharamakrishnan C. Effect of composition on the structure and digestibility of starch in Idli batter.
 4. Mahmoud ESA, Sorour MA. Rice Bran Stabilization by Solid-State Fermentation: Effect on Chemical Composition, Functional Properties and Antioxidant Activity; c2022.
 5. Sarangharaajan A, Jagadeesan S. Studies on an Alternative Method for Preparation and Fermentation of idlis Made from Proso Millet (*Panicum miliaceum* L.), Horsegram (*Macrotyloma uniflorum* (Lam) Verdc.) and Fenugreek (*Trigonella foenum-graecum* L.).
 6. Angadi V, Ramachandra B, Puranik DB, Prabha R. Enumeration of Microflora from Ingredients and Idli Batter. Asian Journal of Dairy and Food Research. 2021;40(3):327-331.
 7. Shaikh A, Siddique I, Shaikh M, Shetty S. Isolation and enumeration of probiotic microorganisms from fermented idli batter. African Journal of Biological Sciences. 2021;3(3).
 8. Mazaheri Y, Torbati M, Damirchi AS, Savage GP. A comprehensive review of the physicochemical, quality and nutritional properties of nigella sativa oil. Food Reviews International. 2018;ISSN:8755-9129. DOI: 10.1080/87559129.2018.1563793.
 9. Krishnamarooty S, Kunithapatham S, Manickam L. Traditional Indian breakfast (Idli and Dosa) with enhanced nutritional content using millets. Nutrition & Dietetics. 2013;70:241-246.
 10. Neha, Kumar V. Studies on Nutritional Improvement and Sensory Evaluation of Fortified Idli. Gorteria Journal. 2021;ISSN:0017-2294.
 11. Adsare AD, Shinde EM, Patil AA, Gajmal DB. Development and quality evaluation of Multigrains Idli. ISSN (E): 2277-7695 ISSN (P): 2349-8242 NAAS Rating: 5.23. The Pharma Innovation Journal. 2022;SP-11(11):725-728. Available from: <https://www.researchgate.net/publication/369827280>.