Bioscene

Bioscene
Volume- 21 Number- 02
ISSN: 1539-2422 (P) 2055-1583 (O)
www.explorebioscene.com

Millet Milk and Flour in Food Industry Applications: Harnessing Nutritional and Functional Potential

Pavithra A R
Department of Food Technology and Nutrition, Lovely Professional University, Phagwara, Punjab, India

Abstract : Millet, a group of highly nutritious and drought-resistant grains, has gained significant attention in the food industry for its potential to enhance health and sustainability. Millet milk and flour, derived from various millet species, offer a multitude of nutritional and functional benefits, making them attractive ingredients for diverse food applications. This abstract explores the innovative uses of millet milk and flour in the food industry, highlighting their nutritional advantages, functional properties, and potential for product development. Millet milk, a plant-based alternative to dairy, is rich in essential amino acids, vitamins, and minerals such as magnesium, phosphorus, and iron. Its hypoallergenic nature and gluten-free composition make it suitable for individuals with lactose intolerance and celiac disease. The production process of millet milk involves the milling of millet grains followed by enzymatic or mechanical extraction of the milk, ensuring the preservation of its nutritional profile. Millet flour, on the other hand, is produced by finely grinding millet grains, resulting in a gluten-free flour with excellent binding properties. Rich in dietary fiber, antioxidants, and essential fatty acids, millet flour contributes to improved digestive health and reduced risk of chronic diseases. Its unique functional properties, such as water absorption and gel formation, enhance the texture and stability of baked goods, snacks, and pasta. Millet flour can be blended with other flours to create nutrient-dense, gluten-free products that cater to health-conscious consumers. The incorporation of millet milk and flour into food products not only addresses the growing demand for functional and health-promoting ingredients but also supports sustainable agricultural practices.

Keywords: Millet milk, Millet Flour, Nutritional attributes, Value added products of millets, Health benefits

Introduction

Food security is highly susceptible to climatic risk especially, where agriculture depends on rainfall (Khanal & Mishra,2017).Millets, belong to the Poaceae family and are highly nutritious small-seeded grains. They are crops that are resilient to drought and require very little water, fertilizers, and pesticides. They are essential to India's ecological and economic security, being a healthier alternative to wheat and rice. India is one of the world's leading millet exporters, with exports increasing from $400 million to $470 million in 2021(APEDA 2022-

23).There are several types of millet, such as finger millet (Eleusine coracana), foxtail millet (Setaria italica), proso millet (Panicum miliaceum), barnyard millet (Echinochloacrusgalli), kodo millet (Paspalum scrobiculatum), pearl millet (Pennisetum glaucum) (Muthamilarasan et al.,2021).Millets as a climate-resilient crop that can survive extreme drought conditions and wild varieties can withstand flooded areas or swampy regions and it is filled with vitamins, minerals, essential nutrients, phytochemicals, and antioxidants that help people who are suffering from cancer or heart disease. Hence millet cultivation can be a productive source to ensure food and nutritional security (Kumar et al.,2018).

To increase the consumption of millets value addition plays a huge role. Industrial applications of millets include pasta, noodles, weaning foods, noodles, nutritional bars, and fermented beverages (Sharma et al.,2021). Millets are an excellent source of essential nutrients such as protein, carbohydrates, fat, minerals, fiber, vitamins, and bioactive compounds which helps to treat many diseases like cancer, celiac diseases, diabetes, and cardiovascular diseases (Yousaf et al.,2021).To enhance the quality of millet-based diets and improve the absorption of micronutrients, innovative processing and cooking methods are necessary. Further research is needed to understand the bioavailability, metabolism, and health advantages of millet grains and their various components in human nutrition. Additionally, there is a need to create superior millet products to encourage their consumption in urban settings and create new opportunities for farmers to increase their income (Tiwari et al.,2023).

Lactose intolerance, which is common nowadays refers to the consumption of lactose-containing dairy products which cause health issues like diarrhoea, and gastrointestinal problems because of the inability to digest lactose sugar. Those people should consume lactose-free or lactose-reduced products, plant-based products, or other substitute products (Szilagyi, & Ishayek,2018).Millet milk is preferred over other plant-based milk due to its high nutritional value and low calorific value (Raajeswari& Nithya,2016).

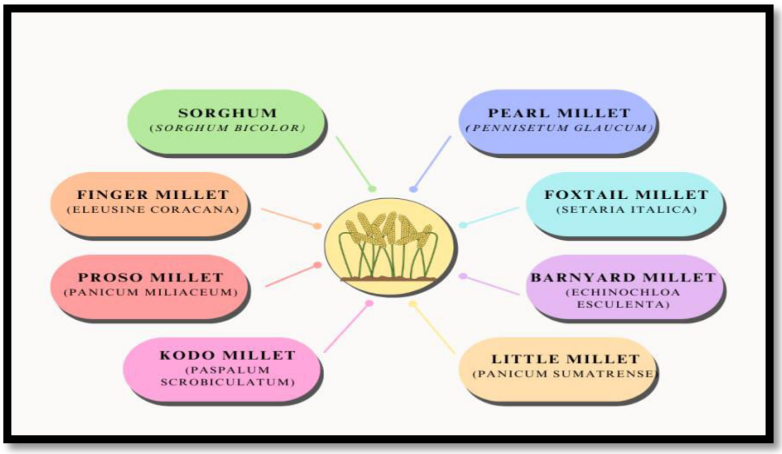

Fig 1: Types of millets

Nutritional and Functional Attributes of Millet Milk

Thephysicochemical of sprouted kodo millet milk areprotein (1.75%), starch (5.73%), reducing sugar(1.79%), total sugar (3.36%), fat (1.21%), calcium (1.63%), TSS (15%), acidity (0.86%) while for raw kodo millet milk, protein (1.71%), starch (6.01%), reducing sugar(1.36%), total sugar (3.82%), fat (1.22%), calcium (1.05%), TSS (15%), acidity (0.74%) (Geetha & Preethi,2020).Millet milk can be utilized for making different value-added products. In this study, five minor millets such as foxtail millet, barnyard millet, kodo millet, proso millet, and little millet were soaked, germinated, and extracted for millet milk. Barnyard millet has the highest moisture content (43.15%) and protein content (8.12%). Kodo millet has a higher carbohydrate content (60.09%) and ash content (0.43%). Little and Kodo millet have the same fat content (0.56). Little millet has a higher crude fiber content (2.44%). Proso millet has the highest reducing sugar content (2.08%) (Sheela et al.,2018).

A dairy-free alternative was prepared using coconut milk and millet milk as a substitution for people who are suffering from lactose intolerance and milk allergy. Millet hasa high mineral value (1.686%) while coconut hasa high amount of fat content (19.966%) and protein (1.974%). Thus, a combination of these will create better sensory and also low-cost milk as compared to other plant-based milk (Sunny et al.,2019).Proso millet milk was extracted by response surface methodology and the results depicted that milk extraction depends on soaking time, water for soaking, and extraction time. The study determined optimized values for soaking hours, water for soaking time, and extraction time, which resulted in the highest desirability index of 0.93. These optimal values were found to be 12 hours, 301 ml, and 30 minutes, respectively. The optimal values for the extracted milk were 449.99 ml, and the pH level was 6.43. The overall acceptability score was 7.90 (Subasshini&Thilagavathi, 2021).

In a study, physicochemical analyses were analyzedto develop fermented millet sprout milk beverages. Through RSM methodology best combinations were optimized in which fat content (2.1%), iron (340mg), protein (450mg), and carbohydrate (14.57mg) in 100ml fermented millet sprout milk beverage. Sedimentation value ranges from 0.4-0.85 ml/10ml, viscosity ranges from 149.1-166.3 cP, wheying off ranges from 0.014-0.020% and acidity ranges from 0.608-0.987% (Sudha et al.,2016). A comparative study was conducted between cow milk, coconut milk, millet milk, and malted millet milk in which, different processing conditions were given such as unprocessed, pasteurization, chilling, freezing, cooling, and hardening at different temperatures (32 °C, 63°C, 4°C, -5 to -6°C, -18°C, -28 to -35°C respectively). Malted millet milk exhibited the highest protein, carbohydrate, energy, and ash activity compared to others in all processing conditions which makes it suitable for the replacement of cow milk and also has low processing cost which makes them ideal for farmers and value addition (Nair et al.,2020).

The physicochemical and morphological characteristics of the developed millet yogurt powder compared to cow milk yogurt powder were analyzed. Results show that millet yogurt powder has a close physical nature to cow milk yogurt powder where flowability (27.6%) was excellent and the pH (4.6) of the yogurt millet milk was near to cow milk yogurt (4.48), the protein content of the yogurt millet milk (4.8) was higher than cow milk yogurt powder (3.45).This result reveals that millet yogurt powder demonstrated a healthier plant-based yogurt option for lactose-free or gluten-free product (Thomas et al.,2023). Millet milk extracted from barnyard millet, little millet, kodo millet, and finger millet was standardized using the enzymatic extraction method. The millet milk produced exhibited appropriate viscosity levels, ranging from 2.32±0.02 to 2.82±0.03, meeting the criteria for plant-based milk. Protein content in the millet milk varied between 1.38±0.03 to 1.12±0.02 g. Finger millet milk demonstrated notable concentrations of total polyphenols (205.72±0.13 mg/100 ml) and total antioxidant activity (81.64±1.77%), whereas barnyard millet milk displayed elevated levels of total flavonoid content (96.25±1.88 mg/100 ml). Enzymatic treatment significantly reduced the presence of anti-nutritional factors like phytic acid, tannin, and trypsin inhibitor activity in the millet milk. This enzymatically treated product showed increased in vitro protein (69.28±0.28 to 85.57±1.39%) and starch digestibility (69.75±0.56 to 63.36±0.12 mg maltose/g) (Shunmugapriya et al.,2020).

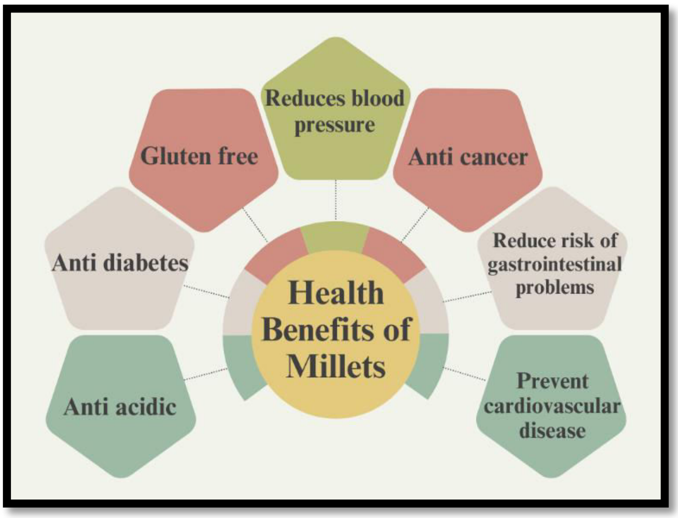

Fig 2: Health benefits of millets

Nutritional and Functional Attributes of Millet Flour

Finger millet, a resilient and nutritious cereal crop commonly cultivated in semi-arid tropical regions, notably increased the water absorption capacity, solubility, and oil absorption capacity of flour samples to a significant degree ($p < .05$) when subjected to the germination process. It thus improved the functional properties of finger millet flour (Yenasew et al.,2023).Finger millet is an excellent example of a balanced content of nutrition which helps to serve as the ultimate food for both humans and animals. Crude fat (7.94±0.06g/100g), crude protein (8.42±0.05g/100g), crudefiber (2.51±0.06g/100g), carbohydrate(73.32±0.23g/100g) (Audu et al.,2018). Barnyard millet is rich in protein, carbohydrates, and fiber, with high levels of iron and zinc compared to other grains. Its low glycemic index and gluten-free nature offer health benefits, including combating obesity, diabetes, and heart issues. Its slow digestion and low-carbohydrate content make it ideal for modern lifestyles. Its fatty acids include linoleic, palmitic, and oleic acids, and it promotes resistant starch formation (Singh et al.,2022).

Sorghum is the most produced cereal after wheat, maize, rice, and barley. It is rich in nutritional composition such as carbohydrates(70–80%), proteins(8–18%), fat(1–5%), dietary fiber(19%), crude fiber(3%), ash (2%), calcium(132mg/g), sodium(2874mg/g), magnesium (1496mg/g),phosphorous(2865mg/g), niacin (2.927mg/100 g),riboflavin (0.142mg/100 g),thiamin (0.237mg/100 g),vitamin B-6 (0.590mg/100 g),vitamin E (0.810mg/100 g) (Hernández et al.,2022).Little millet flour which has a good nutritional status would be able to secure nutritional security has a protein content of 8.42 ± 0.27 %, fat of 2.10 ± 0.99 %, crude fiber of 3.20 ± 0.15 %, Carbohydrates of 74.75 ± 0.36 % and energy value of 351.65 ± 1.1 K. Cal(Srilekha et al.,2019). Pearl millet is known for its nutritional content which helps to uplift the malnutritional problems in the society.Energy value(374.73±6.62%), carbohydrate (69.44±4.23%), crude fiber (1.06±0.00%), fat (7.05±0.67%), protein (8.38±0.33%) (Obadina et al.,2017). Foxtail millet flour after boiling has a protein content of 8.4 g/100g, fat content of 1.9 g/100g, crude fiber of 6.1 g/100g, carbohydrate of 63g/100g, total starch of 13.6g/100g, amylose content of 6.8g/100g, potassium 210mg/100g, phosphorous mg/100g (Nazni&Devi,2016).

Proso millet flour is used as a staple food in many countries. Its nutritional composition includes fat content (3.91 ± 0.13%), protein (16.85 ± 0.09%), amylose content (4.27 ± 0.11%), total starch (64.41 ± 1.46%) (Yang et al.,2019). The quality of Kodo millet flour is superior when compared to many other cereals. The protein content is 7.60 ± 0.10 %, fat 1.24 ± 0.15, ash 1.39 ± 0.05%, crude fiber 4.06 ± 0.03%, carbohydrate 76.04 ± 0.12%, vitamin C 0.67 ± 0.12 mg/100g, dietary fiber 14.78 ± 0.11 g/100g, antioxidant capacity 55.22 ± 1.60% (Srilekha et al.,2019). When comparing germinated barnyard millet flour and raw barnyard millet flour, optimized germinated barnyard millet shows more nutritional composition due to the process of soaking, soaking time, and germination time. The protein content of optimized germinated millet flour is 11.22±0.051, fat content 3.4 ±0.01, total dietary fiber 23.74±0.65, total phenolic content

77.68±0.43, total flavonoid 71.92±2.22, magnesium content 42.62±0.32 while ungerminated barnyard millet has less nutritional when compared i.e. protein content 9.14±0.036, fat content 5.31±0.03, total dietary fiber 21.65±0.45, total phenolic content 29.01±0.31, total flavonoid content 29,02±0.15 and magnesium content is 38.19±0.10 (Sharma et al.,2016).

Extraction of millet milk and flour

Fig 3 shows the extraction of millet milk from millet. First, the grains are washed under running water for 5 minutes to eliminate any foreign particles. They are then soaked in water for 12 hours and drained to remove excess water. The soaked seeds are wrapped in a muslin cloth and allowed to germinate for 24-36 hours. Once germinated, the pearl millet is ground into a paste using an electric grinder. This paste is placed in a muslin cloth and squeezed by hand to extract the milk. The extracted pearl millet milk is then stored in a refrigerator to prevent spoilage (Sheela et al., 2018).

Fig 4 shows the extraction of millet flour from millet. To produce whole flour, millet grains are first cleaned and washed. This can be done either with or without conditioning, which involves adding water to adjust the grain's moisture content for optimal flour extraction. The grains are then milled using either plate milling or stone milling. After milling, the stock is sifted to separate the flour from the bran (Tiefenbacher, 2017).

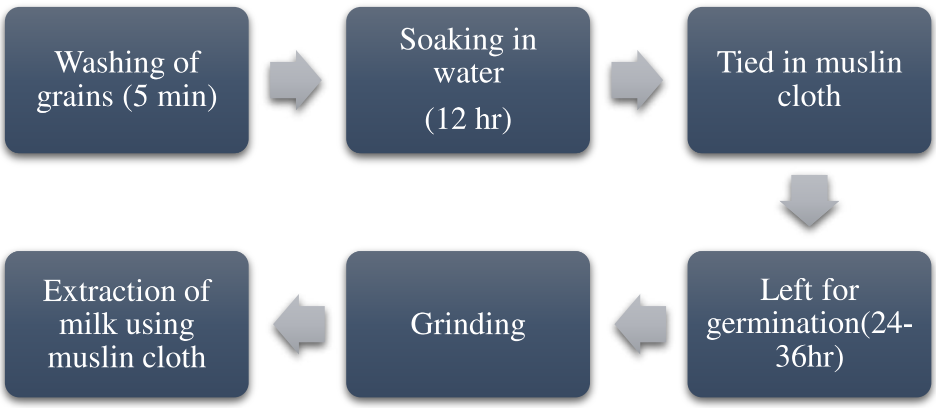

Fig 3: Flow chart of extraction of millet milk from millet

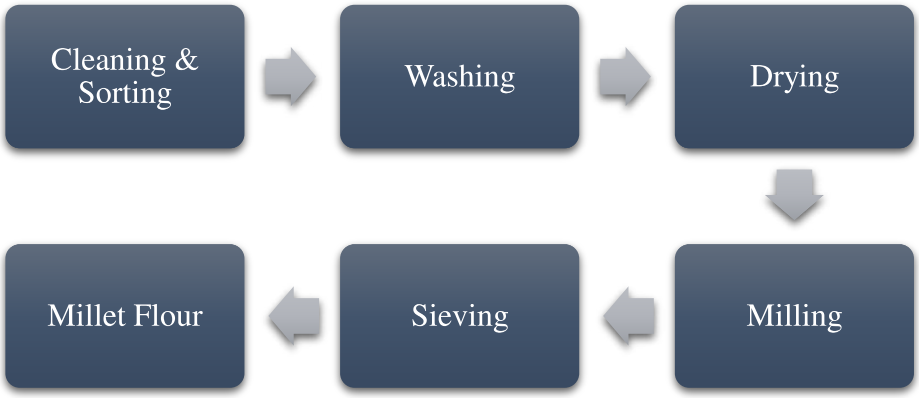

Fig 4: Flow chart of extraction of millet flour from millet

Value-Added Products from Millet Milk

A new type of fermented milk beverage, resembling the traditional Rabadi from North-Western India, was created. This involved fermenting pearl millet flour along with skim milk and flour from germinated pearl millet grains. Through an optimization process using Response Surface Methodology, the perfect balance of flour to water (5.3% flour and 72% water) was determined. Pectin was introduced as a stabilizing agent for storage, with 0.6% deemed most effective. The final product was then stored in glass bottles at a temperature range of 5–7 °C, with a confirmed shelf life of 7 days (Modha et al.,2011).A study found that Lactobacillus strains can be encapsulated using almond gum and maltodextrin with finger millet milk complex. Optimal spray-drying conditions were determined to be 120°C inlet temperature, with 30% maltodextrin and 1.5% almond gum. The resulting powders had an amorphous structure, suitable for use as encapsulating agents. (Anitha et al.,2022).The study aimed to create milk blends using soybean milk and different amounts of foxtail millet. Four formulations were tested, and the ones containing 10% millet received higher ratings for taste and quality. The statistical analysis showed that the inclusion of millet significantly impacted protein, fat, and ash content, while carbohydrate, water, and energy content remained unchanged. Calcium levels increased with the addition of millet, indicating improved nutrition compared to pure soy milk. (Fadly et al.,2021).

Yogurt was prepared from bambaranut milk and millet milk by using starter cultures of Streptococcus thermophillus and Lactobacillus bulgaricus. The yogurt samples were found to be identical in nutritional value to the standard yogurt samples. These findings exhibit that in the future more plant-based yogurt can be developed since it has the same nutritional attributes as the standard yogurt (Elechi et al.,2023).Adding finger millet to probiotic fermented milk can significantly improve diabetes management and reduce lipid levels, according to their research. This combination can also alleviate common diabetic symptoms and offer a glucose-lowering effect similar to metformin. Fermenting the milk-finger millet mix with probiotic culture is crucial for its effectiveness. This product has the potential as a functional food for preventing and managing diabetes (Chaudhary et al.,2020).Studies show that yogurt production using millet milk was prepared and analyzed for its properties. Different ratios of millet milk (0%, 10%, 15%, and 20%) were used instead of low-fat milk (2.5%). Results showed that substituting 10% of millet milk improved pH and reduced syneresis and protein. However, higher ratios of millet milk decreased pH, dry matter, and fat content while increasing syneresis, protein, and phenolic compounds. Yogurt with 10% millet milk was most favored, and based on sensory assessments, pH, acidity, dry matter, fat content, and syneresis results throughout storage, it was identified as the optimal formulation (Forgani et al.,2021).

Using a spray drying process probiotic finger millet milk was optimised. The parameters considered were moisture content, water activity, powder yield, encapsulation capacity, and viability reduction. After conducting several tests, it was discovered that the best process conditions for producing probiotic finger millet milk powder are: 151.68°C inlet air temperature, 100 mL/h feed rate, and 29.32% maltodextrin content. Under these conditions, the powder yield was 43.81%, with an encapsulation efficiency of 84.97%. The scanning electron microscopy (SEM) analysis of the spray-dried powder confirmed that the viable cells were properly encapsulated within the powder matrix. Additionally, X-ray diffraction (XRD) analysis revealed that the powder structure was amorphous, which makes it suitable for various food applications. These positive results could be used to develop non-dairy probiotic finger millet milk powder (Yadav et al., 2024).To meet the priorities of celiac patients' gluten-free cake using millet milk powder with the combination of rice flour was prepared and analyzed. According to the sensory analysis results of the cake samples, it was observed that the texture score of the samples declined as the levels of Millet milk powder (MMP) and xanthan gum increased, which resulted in higher viscosity and decreased volume. Among the samples, the one containing 0.15% xanthan gum received the highest score. Therefore, it was concluded that the cake sample formulated with 10% MMP and 0.15% xanthan gum showed the most favorable sensory and quality attributes (Akbari et al.,2023).

Millet egg tofu was developed using milkextracted from barnyard millet, foxtail millet, and little millet. The research found that the total phenolic content and DDPH activity of the tofu increased. The study also determined that the best results were achieved with a hardness value of 4.08 N, appearance score of 5.97, color score of 5.91, taste score of 5.61, and overall acceptability score of 6.05. These optimal values were achieved by using a combination of 2.3% barnyard millet milk, 2.41% foxtail millet milk, and 20.36% little millet milk (Peerkhan et al.,2022).An ice cream has been developed using barnyard millet milk, which is suitable for people who suffer from diabetes and lactose intolerance. The barnyard millet ice cream is rich in protein, which is easily digestible, and a great source of dietary fiber, containing both soluble and insoluble fractions. The use of extracted barnyard millet milk has proven to be a beneficial alternative to cow milk in preparing this ice cream (Sakthivel et al.,2023).

With the application of probiotics, yogurt was made with the combination of soya-finger millet milk. Results shows that it has lower proximate constituents compared to the control and soya yogurt but shows higher activity for total polyphenols and total flavonoids (Anand et al.,2011).A probiotic beverage was created using pearl millet milk and in different concentrations apple and pineapple juices were added. It is then fermented by adding starter culture L. plantarum strain MK1 at 37°C for 48 h. Beverages made by combining millet milk and pineapple juice in equal parts demonstrated superior qualities in terms of physical and chemical attributes, viability of strains, and sensory evaluations compared to alternative methods. This highlights the potential to transform underutilized crops like pearl millet into value-added products with beneficial health properties. Additionally, a fermented beverage based on probiotic pearl millet milk could enhance nutritional content and energy density, addressing issues related to malnutrition (Gupta et al.,2017). Paneer was made using mixed millet milk and cow milk in different compositions. Results reveal that mixed millet panner has more nutritional value than standard paneer. Mixed millet paneer has a greater amount of protein value (52.83±0.52) as compared to standard paneer (19.93±0.34). The inclusion of mixed millet such as finger millet, foxtail millet, and pearl millet will enhance the nutritional content of paneer since it is filled with antioxidants, protein, dietary fiber, and minerals thus it is an excellent choice as an alternative for standard paneer(Sundari et al., 2023b). An ice cream was developed using barnyard milk millet, soybean milk, and coconut cream. This ice cream was prepared with concern for people who are suffering from milk allergy, lactose intolerance, or a vegan diet. Barnyard millet milk is a fine alternative to standard cream since it has abundant nutritional attributes. Results reveal barnyard millet milk ice creams have a high amount of protein content compared to standard ice cream (Amritha et al., 2021).

Value-Added Products from Millet Flour

In recent research for valorizing finger millet flour several products such as biscuits, muffins, crackers, laddoos, and chikkis. Their nutritional composition was found to be rich in minerals like calcium, phosphorous, iron, fiber, and have a low-calorie rate when compared to control samples. So, these results show that finger millet flour is a healthier option and can cure CVDs, osteoporosis, and anemia (Sharma & Yamer 2022).Pearl millet is known as a "nutritional powerhouse" because it contains all the vital nutrients. Therefore, to increase the consumption value addition through different products such as pearl millet laddu, pearl millet mathri, and cake made from Biofortified Pearl Millet Hybrid HHB-299. These value-added products show high sensory acceptance and nutritive value which meansthey can be commercialized (Kalash et al.,2023). Sorghum flour is a gluten-free flour that is high in phytochemicals and especially antioxidant-rich. Sorghum flour is generally used in traditional dishes like porridge but now, in food modern industries since sorghum shows properties of wheat like it is used in cakes, flatbreads, and cookies (Taylor & Anyango,2011).

Cookies were made by replacing wheat flour with pearl millet flour (PMF) from three varieties (Shanti, Dhanshakti, and Pioneer 84M64) at 0%, 10%, 20%, 30%, 40%, and 50% levels using a traditional creamery method. Adding PMF decreased the diameter, spread ratio, and spread factor of the cookies, while slightly increasing their thickness. The L* and b* color values decreased, and the a* value increased with more PMF. Additionally, the hardness, breaking strength, and cutting strength of the cookies rose with more PMF. Among the varieties, Dhanshakti PMF resulted in the best physical and textural quality (Kulthe et al.,2017).Incorporating a blend of millet flour and soy flour enhanced the nutrient density, glycemic response, gruel solid loss, and taste of noodles. However, the cooking time increased. While noodles made with 20% millet blend composite flour (MBCF) were acceptable, those made with 10% MBCF were highly preferred, second only to noodles made with standard composite flour. Therefore, using millet flour blend and defatted soy flour shows promise as an ingredient for healthy noodle products (Vijaykumar et al.,2010).A probiotic beverage was created using both germinated and ungerminated pearl millet flour mixed with green gram milk at concentrations of 0.5% to 2.5%, along with sugar and cardamom. The mixtures were inoculated with Lactobacillus acidophilus and incubated at 37°C for 6 hours. The beverages were then stored at 4°C for 21 days for characterization. The germinated flour beverage exhibited higher acidity compared to the ungerminated one. Probiotic counts ranged from 8.19 to 8.77 × 10^7 CFU/mL in germinated flour beverages and 8.04 to 8.52 × 10^7 CFU/mL in ungerminated ones. Higher flour concentration increased antioxidant and polyphenol activity (Ghoshal et al.,2024).

References

1. Akbari, S., Alami, M., Maqsoodlou, Y., &Mahonak, A. S. (2023). Effect of millet milk powdre on the physico-chemical properties of gluten-free cake based on rice flour. Iranian Journal of Food Sciences and Industries, 20(138).

2. Amirtha, G., Vijaya Vahini, R., & Sarah Priscilla, S. (2021). Formulation and proximate evaluation of barnyard millet based ice cream. Int J Multidiscip Res Arts Sci Com, 1(2), 59-66.
3. Anand, D., & Kapoor, R. Studies On Composition Of Probiotic So Studies On Composition Of Probiotic Soya-Finger Millet Milk Based Y Millet Milk Based Yoghurt.
4. Anitha, D. P. M., & Sellamuthu, P. S. (2022). Microencapsulation of probiotics in finger millet milk complex to improve encapsulation efficiency and viability. Food Science and Technology International, 28(3), 216-232.
5. Audu, S. S., Ehanwo, A. A., Aremu, M. O., Tukura, B. W., Ambo, A. I., & Usman, A. (2018). Chemical composition of finger millet (Eleusine coracana) flour. FUW Trends in Science and Technology Journal, 3(2B), 905-908.
6. Chaudhary, J. K., & Mudgal, S. (2020). Antidiabetic and hypolipidaemic action of finger millet (Eleusine coracana)-enriched probiotic fermented milk: An in vivo rat study. Food technology and biotechnology, 58(2), 192.
7. Elechi, J. O. G., Abu, J. O., & Eke, M. O. (2023). The application of blends of bambaranut and millet vegetable milk in the development of plant-based yoghurt analogues: Proximate composition, physiochemical properties, microbial safety and consumer's acceptability. Food and Health, 9(1), 43-60.
8. Espitia-Hernández, P., Chavez Gonzalez, M. L., Ascacio-Valdés, J. A., Dávila-Medina, D., Flores-Naveda, A., Silva, T., ... & Sepúlveda, L. (2022). Sorghum (Sorghum bicolor L.) as a potential source of bioactive substances and their biological properties. Critical Reviews in Food Science and Nutrition, 62(8), 2269-2280.
9. Fadly, D., Sutarno, W. U., Muttalib, Y. S., Muhajir, M., &Mujahidah, F. F. (2021, July). Plant-based milk Developed from Soy (Glycine max) Milk and Foxtail Millet (Setaria italica). In IOP Conference Series: Earth and Environmental Science (Vol. 807, No. 2, p. 022063). IOP Publishing.
10. Forgani, S., Peighambardoust, S. H., &Dastras, M. (2021). The effect of replacing cow milk by millet milk on the physical, chemical and organoleptic characteristics of set yogurt. Journal of food science and technology (Iran), 18(110), 27-36.
11. Geetha, P., & Preethi, P. (2020). Development of kodo millet based functional milk beverage. IJCS, 8(6), 1034-1037.
12. Ghoshal, G., Kamboj, J., & Kaur, P. (2024). Pearl millet flour and green gram milk based probiotic beverage. International Journal of Food Microbiology, 417, 110696.
13. Gupta, M. Studies on development and evaluation of millet based probiotic beverage.

14. Kalash, P., Tewari, P., Kachhawaha, S., Rathore, B. S., & Singhal, S. (2023). Organoleptic and Nutritional Evaluation of Pearl Millet (Bio-Fortified, Var. HHB-299) Value Added Products: Organoleptic evaluation of biofortified pearl millet. Annals of Arid Zone, 62(2), 155-159.
15. Khanal, A. R., & Mishra, A. K. (2017). Enhancing food security: Food crop portfolio choice in response to climatic risk in India. Global food security, 12, 22-30.
16. Kulthe, A. A., Thorat, S. S., & Lande, S. B. (2017). Evaluation of physical and textural properties of cookies prepared from pearl millet flour. International Journal of Current Microbiology and Applied Sciences, 6(4), 692-701.
17. Kumar, A., Tomer, V., Kaur, A., Kumar, V., & Gupta, K. (2018). Millets: a solution to agrarian and nutritional challenges. Agriculture & food security, 7(1), 1-15.
18. Modha, H., & Pal, D. (2011). Optimization of Rabadi-like fermented milk beverage using pearl millet. Journal of food science and technology, 48, 190-196.
19. Muthamilarasan, M., & Prasad, M. (2021). Small millets for enduring food security amidst pandemics. Trends in plant science, 26(1), 33-40.
20. Nair UK, A., Hema, V., Sinija, V. R., & Hariharan, S. (2020). Millet milk: A comparative study on the changes in nutritional quality of dairy and nondairy milks during processing and malting. Journal of Food Process Engineering, 43(3), e13324.
21. Nazni, P., & Devi, R. S. (2016). Effect of processing on the characteristics changes in barnyard and foxtail millet.
22. Obadina, A. O., Arogbokun, C. A., Soares, A. O., de Carvalho, C. W. P., Barboza, H. T., & Adekoya, I. O. (2017). Changes in nutritional and physico-chemical properties of pearl millet (Pennisetum glaucum) Ex-Borno variety flour as a result of malting. Journal of food science and technology, 54, 4442-4451.
23. Peerkhan, N., Jawahar, P., &Tharmaraj, P. (2022). Optimization of antioxidant activity and sensory parameters of millet egg tofu using mixture design. Journal of Food Processing and Preservation, 46(4), e16486.
24. Raajeswari PA, Nithya M. Standardization of Value Added Recipes with Millet Milk Powder. Research & Reviews: Journal of Food Science and Technology. 2016; 5(2): 10–17p.
25. Sakthivel, R., Deva, S., Indumathi, M., Rajesh, S., & Dharani, P. (2023). Formulation Of Millet Based Ice Cream Utilizing Echinochloa Esculenta. Journal Of Technical Education, 319, 319.
26. Sharma, D., & Yamer, P. (2022). Value addition of products from finger millet (Eleusine coracana). Journal of Postharvest Technology, 10(2), 120-138.

27. Sharma, R., Sharma, S., Dar, B. N., & Singh, B. (2021). Millets as potential nutri-cereals: a review of nutrient composition, phytochemical profile and techno-functionality. International Journal of Food Science & Technology, 56(8), 3703-3718.
28. Sharma, S., Saxena, D. C., & Riar, C. S. (2016). Analysing the effect of germination on phenolics, dietary fibres, minerals and γ-amino butyric acid contents of barnyard millet (Echinochloafrumentaceae). Food Bioscience, 13, 60-68.
29. Sheela, P., Kanchana, S., Maheswari, T. U., & Hemalatha, G. (2018). Optimization of parameters for the extraction of millet milk for product development. Research Journal of Agricultural Sciences, 9(6), 1345-1349.
30. Shunmugapriya, K., Kanchana, S., Maheswari, T. U., Kumar, R. S., &Vanniarajan, C. (2020). Standardization and stabilization of Millet milk by enzyme and its physicochemical evaluation. European Journal of Nutrition & Food Safety, 12(1), 30-38.
31. Singh, A., Bharath, M., Kotiyal, A., Rana, L., & Rajpal, D. (2022). Barnyard millet: the underutilized nutraceutical minor millet crop. J Pharm Innov, 11(6), 115-128.
32. Srilekha, K., Kamalaja, T., Maheswari, K. U., & Rani, R. N. (2019). Evaluation of physical, functional and nutritional quality parameters of kodo millet flour. Journal of Pharmacognosy and Phytochemistry, 8(4), 192-195.
33. Srilekha, K., Kamalaja, T., Uma Maheswari, K., & Neela Rani, R. (2019). Nutritional composition of little millet flour. International Research Journal of Pure and Applied Chemistry, 20(4), 1-4.
34. Subasshini, V., &Thilagavathi, S. (2021). Optimization and proximate analysis of prosomillet milk using response surface methodology.
35. Sudha, A., Devi, K. S., Sangeetha, V., & Sangeetha, A. (2016). Development of fermented millet sprout milk beverage based on physicochemical property studies and consumer acceptability data.
36. Sundari, N. B., S., M, S., D, D., Reddy, R., R, M., J, H., A, C. M., & S, S. (2023b). Formulation And Evaluation Of Mixed Millet Paneer. Eur. Chem. Bull., 12(Si6),6091–6102.
37. Sunny, J. D., Kundu, P., &Mehla, R. (2019). Preparation and Physicochemical Evaluation of Dairy Free Alternative Based on Coconut and Millet Milk. Int. J. Pharm. Biol. Sci, 9, 565-572.
38. Szilagyi, A., &Ishayek, N. (2018). Lactose intolerance, dairy avoidance, and treatment options. Nutrients, 10(12), 1994.
39. Taylor, J. R., & Anyango, J. O. (2011). Sorghum flour and flour products: production, nutritional quality, and fortification. In Flour and breads and their fortification in health and disease prevention (pp. 127-139). Academic Press.
40. Thomas, T., Singh, N., & Sagar, P. (2023). Physicochemical and Morphological Analysis of Millet Yoghurt Powder: Characterization and

Quality Evaluation. Asian Journal of Food Research and Nutrition, 2(4), 374-379.

41. Tiwari, H., Naresh, R. K., Bhatt, R., Kumar, Y., Das, D., & Kataria, S. K. (2023). Underutilized nutrient rich millets: challenges and solutions for India's food and nutritional security: a review. International Journal of Plant & Soil Science, 35(2), 45-56.
42. Vijayakumar, T. P., Mohankumar, J. B., & Srinivasan, T. (2010). Quality evaluation of noodles from millet flour blend incorporated composite flour.
43. Yadav, S., & Mishra, S. (2024). Optimization of spray-drying process for the microencapsulation of L. Plantarum (MCC 2974) in ultrasound hydrated finger millet milk. Food Science and Biotechnology, 1-12.
44. Yang, Q., Liu, L., Zhang, W., Li, J., Gao, X., & Feng, B. (2019). Changes in morphological and physicochemical properties of waxy and non-waxy proso millets during cooking process. Foods, 8(11), 583.
45. Yenasew, A., & Urga, K. (2023). Effect of the germination period on functional properties of finger millet flour and sensorial quality of porridge. Food Science & Nutrition, 11(5), 2336-2343.
46. Tiefenbacher, K. F. (2017). The technology of wafers and waffles I: Operational aspects. Academic Press.