

Nutritional Configuration of Finger Millets

Tushar S. Jagadale, Digambar D. Ahire

Department of Botany, New Arts, Commerce and Science College,
Ahmednagar (Autonomous), Ahilyanagar – 414 001, Maharashtra, India

Email: tusharjagadale1995@gmail.com, drdigamberahire@gmail.com

Article DOI Link: <https://zenodo.org/uploads/19667483>

DOI: [10.5281/zenodo.19667483](https://doi.org/10.5281/zenodo.19667483)

Abstract

Finger millet (*Eleusine coracana*), or ragi, is a resilient cereal widely grown in Africa and South Asia. Once considered an “orphan crop,” it is now valued for food security in climate-stressed regions. Its grains are rich in complex carbohydrates, slowly digestible starch, and dietary fiber, supporting glycemic control. Protein levels are moderate but notable for methionine, an essential amino acid often lacking in other cereals. Finger millet also provides high calcium, iron, magnesium, phosphorus, and B-vitamins, making it effective against micronutrient deficiencies. Polyphenols and flavonoids add antioxidant benefits, reducing risks of chronic diseases. Traditional processing methods like fermentation and germination enhance nutrient bioavailability. With its nutritional strength and adaptability, finger millet is a strategic crop for sustainable diets.

Keywords: Finger millet; Nutritional composition; Micronutrient-rich cereals; Functional food; Sustainable food systems

Introduction

Finger millet (*Eleusine coracana*), known as ragi in South Asia and widely grown in Africa, is a traditional staple in semi-arid regions. Although often labeled an “orphan crop” due to limited research attention, it is gaining importance for its resilience, low input needs, and rich nutritional profile (Majumder et al., 2024). With increasing concerns about food insecurity, micronutrient deficiencies, and diet-related diseases, finger millet is recognized as a valuable, nutrient-dense, and climate-resilient crop (Mandavgane et al., 2026). Research highlights its strong nutritional composition and health benefits, supporting its role as a functional food (Kajla & Chaudhary, 2026). This chapter reviews its nutritional characteristics, including nutrient composition, phytochemicals, and health effects, along with factors influencing its quality and its potential integration into modern diets.

Macronutrients

Finger millet is predominantly composed of carbohydrates (65–75%), with a significant proportion of slowly digestible and resistant starch that supports glycemic control (Shobana et al., 2013). Its dietary fiber content (11–18%) is largely insoluble, aiding digestion, satiety, and cardiovascular health (Thakur, 2024). Protein levels range from 5.6–12.7%, notable for methionine, cysteine, and tryptophan, which improve protein quality compared to other cereals (Chandra et al., 2025). Lipid content is low (1–1.5%), but the presence of linoleic and oleic acids contributes to favorable fatty acid profiles and long shelf life (Singh & Upadhyay, 2026).

Micronutrients

Finger millet is exceptionally rich in minerals, especially calcium (344–450 mg/100 g), which is far higher than rice or wheat, making it valuable for bone health (Abioye et al., 2022). It also provides iron (3.9–5.4 mg/100 g), magnesium, phosphorus, and potassium, supporting metabolic and physiological functions (Obilana & Manyasa, 2002). In addition, finger millet contains B-group vitamins such as thiamine, riboflavin, niacin, pyridoxine, and folic acid, which are essential for energy metabolism and nervous system function (Shobana et al., 2013). Though moderate in quantity, these vitamins contribute meaningfully to dietary adequacy, especially in resource-limited diets.

Bioactive Compounds and Phytochemicals

Finger millet is particularly rich in polyphenols such as ferulic acid, catechins, tannins, and flavonoids, concentrated in the seed coat, which provide strong antioxidant activity and help reduce oxidative stress (Singh & Upadhyay, 2026). Its polyphenol content is higher than most cereals, contributing to disease-preventive effects (Rakkammal et al., 2024). The grain's high dietary fiber further supports gut health, glucose regulation, and cholesterol metabolism (Kajla & Chaudhary, 2026), while resistant starch enhances metabolic outcomes (Kumar et al., 2024). Although antinutritional factors like phytates and tannins may limit mineral absorption, they also provide antioxidant benefits, and traditional processing methods such as soaking, germination, and fermentation significantly improve nutrient bioavailability (Devi et al., 2014).

Challenges and Opportunities for Mainstreaming Finger Millet

Despite its dietary advantages, ragi remains underutilized in many regions due to factors such as limited consumer awareness, lack of processing infrastructure, and competition from higher-yielding cereals (Nirgude et al., 2020). Policy interventions, farmer education, and value chain development are needed to promote its wider adoption. Research and breeding efforts aimed at reducing antinutritional factors, improving grain yield and palatability, and developing

convenient food products are critical to mainstreaming finger millet in contemporary diets (Gupta et al., 2017). Public health campaigns, school feeding programs, and integration into urban markets can further drive demand and support nutrition-sensitive agriculture.

Conclusion

Finger millet offers a compelling case for the integration of traditional crops with modern nutritional science and sustainable agriculture. Its exceptional mineral content, dietary fiber, bioactive compounds, and health-promoting properties position it as a “super grain” for the 21st century. As the world faces mounting challenges of food insecurity, malnutrition, and environmental stress, the promotion and mainstreaming of ragi can contribute significantly to nutritional security and sustainable food systems. Continued investment in research, breeding, processing technology, and policy support will be important for realizing the full potential of this remarkable cereal.

References

1. Majumder, R., Miatur, S., Roy, S., Saha, A., Manik, S., Biswas, N., & Hossain, S. (2024). Millet starch-based film: A review. *Trends in Food Science & Technology*, 151, 104618.
2. Singh, S., & Upadhyay, S. K. (Eds.). (2026). *Millets as superfood: Biochemistry, biotechnology, and applications* (1st ed.). CRC Press.
3. Mandavgane, S. A., Anandharamakrishnan, C., & Deotale, S. M. (n.d.). *Millets: A sustainable and nutritious crop*.
4. Kajla, P., & Chaudhary, V. (Eds.). (2026). *Finger millet: Nutritional properties, processing, and utilization* (1st ed.). CRC Press.
5. Shobana, S., Krishnaswamy, K., Sudha, V., Malleshi, N. G., Anjana, R. M., Palaniappan, L., & Mohan, V. (2013). Finger millet (ragi, *Eleusine coracana*) - A review of its nutritional properties, processing, and health benefits. *British Journal of Nutrition*, 110(5), 830–850.
6. Thakur, M. (Ed.). (2024). *Millets: The multi-cereal paradigm for food sustainability*. Springer.
7. Chandra, N., Devi, R., Verma, A. K., Shekhar, C., & Sakshi. (2025). Effect of incorporation of finger millet flour (ragi flour) on texture profile of chicken nuggets. *Asian Journal of Dairy and Food Research*. Advance online publication.
8. Obilana, A. B., & Manyasa, E. (2002). Millets. In P. S. Belton & J. R. N. Taylor (Eds.), *Pseudocereals and less common cereals: Grain properties and utilization potential* (pp. 177–217). Springer.
9. Abioye, V., Babarinde, G., Ogunlakin, G., et al. (2022). Varietal and processing influence on nutritional and phytochemical properties of finger millet: A review. *Heliyon*, 8, Article eXXXXX.

10. Rakkammal, K., Pandian, S., & Ramesh, M. (2024). Physiological and biochemical response of finger millet plants exposed to arsenic and nickel stress. *Plant Stress*, 11, 100389.
11. Kumar, S., Sinha, T., & Mishra, S. (2024). Physiological traits associated with genetic improvement of small millets. In *Genetic improvement of small millets* (pp. 153–174). Springer Nature Singapore.
12. Devi, P. B., Vijayabharathi, R., Sathyabama, S., Malleshi, N. G., & Priyadarisini, V. B. (2014). Health benefits of finger millet (*Eleusine coracana* L.) polyphenols and dietary fiber: A review. *Journal of Food Science and Technology*, 51(6), 1021–1040.
13. Nirgude, M., Chimmad, B. V., & Naik, R. K. (2020). Finger millet [*Eleusine coracana* (L.) Gaertn.]—An orphan crop with potential for nutritional security. *Frontiers in Nutrition*, 7, 601661.
14. Gupta, S. M., Arora, S., Mirza, N., Pande, A., Lata, C., Puranik, S., & Kumar, A. (2017). Finger millet: A “certain” crop for an “uncertain” future and a solution to food insecurity and hidden hunger under stressful environments. *Frontiers in Plant Science*, 8, 643.