



Nutritional Importance of Finger Millet: A Review

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ABSTRACT

Finger millet [*Eleusine coracana* (L.) Gaertn.] is an important crop of the Poaceae family and a staple food for millions of people in Asia and Africa. Originating in East Africa, it was later introduced to India, which is now one of its major producers. The crop is valued for its adaptability to marginal environments, drought tolerance, low-input cultivation and excellent storage ability. It is also recognized as a nutrient-rich cereal owing to its high calcium, dietary fiber, protein, essential amino acids, minerals and bioactive compounds. Information on the nutritional composition, genetic diversity and improvement of ragi has been generated through morphological, biochemical and molecular studies. DNA marker systems such as RAPD, SSR and ISSR, along with genomics-based approaches, have been employed to assess genetic variability, population structure and traits related to nutrition and stress tolerance. Studies have revealed considerable genetic diversity among ragi germplasm and significant variation in nutritional traits. The grain contains high levels of calcium, iron, dietary fiber, protein and bioactive compounds with antioxidant properties. Molecular tools have facilitated the identification of superior genotypes and supported the development of nutritionally enhanced and stress-tolerant cultivars, emphasizing the crop's importance for sustainable agriculture and food security.

Key words: Dietary fibre, Finger millet, Macronutrients, Nerve impulse conduction, Nutrient crop, Nutritional profile, Proteins.

Finger millet [*Eleusine coracana* (L.) Gaertn.], named for its panicle-shaped inflorescence with finger-like spikes, is an ancient cereal widely cultivated in South Asia and Africa (De Wet, 2006; Quattrocchi, 2006). Each spike bears numerous spikelets containing small seeds (Dida *et al.*, 2006). The grain is valued for its long storage life and resilience under drought conditions, making it a reliable staple food (FAO, 2012). Traditionally consumed as cooked grain, sprouts and fermented beverages, it also serves as feed for young or recovering animals in certain regions (Sampath, 1986).

Nutritionally, the grains is distinguished by its high calcium (344 mg/gm) and iron (3.9 mg/gm) content (Gopalan *et al.*, 2009), abundant polyphenols with antioxidant properties (Geetha *et al.*, 1990) and slowly digesting starch that supports sustained energy release (Wadikar *et al.*, 2007). It provides 5-8% protein, 65-75% carbohydrates, 15-20% dietary fibre and 2.5-3.5% minerals (Chethan and Malleshi, 2007). The grain also contains essential amino acids, phosphate and vitamins, making it a cost-effective source of nutrition, particularly in mountainous regions (Gopalan *et al.*, 2004).

With growing consumer awareness of health benefits, ragi flour has gained popularity for its role in managing anaemia, cholesterol, bone health and weight loss. Its resistant starches and nutrient density have encouraged the development of diverse value-added products such as noodles, biscuits, cookies and health drinks (Wadikar *et al.*, 2007). Improved post-harvest processing and urban cultivation have further enhanced its accessibility, positioning ragi as a sustainable and affordable nutritional resource.

History and origin

Finger millet is a widely cultivated grain in Africa and India (Thapa and Tamang, 2004). It was domesticated about

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5000 years ago in the highlands of Eastern Africa, making it the oldest known tropical African cereal (Joshi *et al.*, 2021). Historical, linguistic and distributional evidence supports its African origin, from where it spread to India around 3000 years ago, southern Africa 800 years ago and later to South East Asia (Bhat *et al.*, 2018). Archaeological and botanical studies confirm its domestication in East Africa, particularly Ethiopia, with *E. coracana* subsp. *africana* identified as its closest wild relative (De Wet and Huckabay, 1966; Hilu and De Wet, 1976). All cultivated forms belong to *E. coracana* subsp. *coracana*, distinguished by inflorescence morphology and geographic distribution (Hilu and De Wet, 1976).

In India, *ragi* is a major crop, especially in Maharashtra, where it occupies nearly half of the millet growing area and it two thirds of small millet production (Gurav, 2019). About 120 thousand hectares are cultivated, with productivity of 908 kg/ha and annual production of 109 thousand tonnes (Prasad, 2002). It is grown across districts including Thane, Raigad, Ratnagiri, Sindhudurg, Dhule, Jalgaon, Nashik,

Pune, Satara and Kolhapur, with the Konkan region having the largest acreage (Bhagat *et al.*, 2019; Deshmukh, 2007). In irrigated areas, it is also harvested as a *rabi* crop, underscoring its importance in regional food security.

Importance of millets in changing environment

Millets were domesticated in Northern China as early as 10,000 years ago (Yang *et al.*, 2005) and are typically cultivated on marginal soils with low fertility and limited rainfall. The seven major millets grown worldwide include finger millet, pearl millet, foxtail millet, barnyard millet, proso millet, kodo millet and little millet. As climate change reduces yields of staple cereals, millets have gained importance for their resilience. Being C4 plants, they exhibit high photosynthetic efficiency, short growth cycles and strong tolerance to heat and drought.

India is the largest producer, contributing 38-40% of global millet output, followed by African nations such as Nigeria, Niger, Mali, Burkina Faso, Chad and China (Chandra *et al.*, 2016). Major producing states include Rajasthan, Maharashtra, Gujarat, Andhra Pradesh, Chhattisgarh, Haryana, Madhya Pradesh, Odisha, Karnataka, Uttar Pradesh, Tamil Nadu and Telangana. However, between 2016-17, millet cultivation area declined by nearly 60% due to changing consumption patterns, land conversion to rice and wheat, low yields and reduced demand, leading to nutritional deficiencies and malnutrition. To address this, multidisciplinary approaches have been adopted by Indian and international organizations to improve productivity (Baltensperger, 2002; Collett, 2013). Notably, the pearl millet

genome sequencing consortium identified genes for heat and drought tolerance, offering potential benefits for millets and other crops.

Genetic diversity of finger millet

The cultivated ragi is an allotetraploid ($2n = 4X = 36$, AABB) with a genomic size of 1,593 Mb (Goron and Raizada, 2015). Evidence indicates Africa as the primary centre of origin, with greater diversity observed in African germplasm compared to Indian collections. However, centuries of cultivation, natural mutations and farmer selection in India have generated a wide range of local cultivars and landraces. Analyses of Indian germplasm reveal high variability in traits such as finger length, finger width, finger number, grain yield, ear weight, biomass and leaf number, supporting India as a secondary centre of diversity (Gopalan *et al.*, 1999).

This millet is a major food grains in Asia and Africa (Thapa and Tamang, 2004). Beyond its nutritional value, the crop is notable for environmental sustainability, particularly its long shelf life, which reduces post harvest losses (Kumar *et al.*, 2016). Breeding progress for yield and related traits is genetically regulated, environmentally influenced and shaped by the extent of genetic diversity (Wright, 1921; Fisher, 1936). The availability of diverse germplasm and variability within populations are key drivers of improvement through conventional breeding methods (Krishna *et al.*, 2008). In India, several varieties have recently been released through different breeding practices, as summarized in Table 1.

Table 1: State wise varieties of finger millet till 2023 in India.

Name of the states	No. of varieties	Name of the varieties
Karnataka	25	GPU 28, GPU-45, GPU-48, PR 202, MR 1, MR 6, Indaf 7, ML365, GPU 67, GPU 66, KMR 204, KMR 301, KMR 340, VL Ragi-146, Akshaya, Champavathi, Bhairabi, GPU-26, L-5, Divya, Rathana, Indaf-5, Indaf-15 and Indaf-9, HR-911
Tamil Nadu	23	GPU 28, CO 13, CO 9, CO 12, CO 15, Champavathi, Chilika, Co (Ra)-14, Paiyur (Ra)-2, GPU-67, CO-7, CO-10, CO-11, CO-13, CO-14, Paiyur (Ra)-2, K-567, Indaf-5, Indaf-7, Indaf-9, Paiyur-1, PR-202, TRY-1
Andhra Pradesh	21	VR 847, PR 202, VR 708, VR 762, VR 900, VR 936, Padmawathi, Maruti, Bhairabi, Champavathi, Chilika, Bharathi, Shri Chaitanya, Kalyani, Godawari, AKP-2, SURAJ, Simhadri, Ratnagiri, Gouthami, Sapthagiri
Jharkhand	5	A 404, BM 2, VL 379, GPU-45, GPU-67
Orissa	8	OEB 10, OUAT 2, BM 9-1, OEB 526, OEB-532 Subra, Chilika, Saura
Uttarakhand	14	PRM-2, VL 315, VL 324, VL352, VL 149, VL 146, VL-348, VL-376, PES 400, VL 379, VL 380, VL 378, VL 382, GPU 67,
Chhattisgarh	18	Chhattisgarh-2, BR-7, GPU 28, PR 202, VR 708, VL 149, VL 315, VL 324, VL 352, VL 376, PRM-1, Bhairabi, Chilika, Saura, PR-202, Ratnagiri, HR-374, VL-147.
Maharashtra	9	Dapoli 1, Phule Nachani, KOPN 235, KoPLM 83, Dapoli-2, Dapoli safed, Bhairabi, GPU-45, GPU-67
Gujarat	9	GN 4, GN 5, GNN 6, GNN 7, Gujarat Nagali-2, Gujarat Nagali-3, Chilika, GPU-45, Saura
Bihar	6	RAU 8, VL 379, OEB 526, OEB 532, Birsar Marua-2, BR-407
Uttar Pradesh	2	KM-65, Champavathi
Madhya Pradesh	3	Bhairbi, Chilika, GPU-45

Source: ICAR-Indian Institute of Millets Research and AYOM-2023.

Nutritional value

Carbohydrates

Carbohydrates are essential for energy metabolism, regulation of blood sugar and insulin, cholesterol balance and fermentation processes in the human body. Glucose derived from dietary carbohydrates serves as fuel, with excess stored in the liver and muscles. Finger millet is an excellent source of complex carbohydrates and dietary fibre, making it nutritionally valuable, particularly in regions such as Karnataka where it remains a staple (Chandra *et al.*, 2016).

The total carbohydrate content of *ragi* ranges from 72 to 79.5% (Pore and Magar, 1979; Hulse *et al.*, 1981; Joshi and Katoch, 1990; Bhatt *et al.*, 2003). Starch is the major component, reported between 59.4 and 70.2% (Pore and Magar, 1979; Wankhede *et al.*, 1979; Antony *et al.*, 1996; Nirmala *et al.*, 2000; Mittal, 2002). Starch granules are polygonal and rhombic in shape (Jideani *et al.*, 1996), with 80-85% amylopectin and 15-20% amylose (Wankhede *et al.*, 1979; Jideani *et al.*, 1996). Non starch polysaccharides account for 20-30% of total carbohydrates (Bhatt *et al.*, 2003). Reducing sugars are reported in the range of 1.2-1.8% (Pore and Magar, 1979), while Nirmala *et al.* (2000) found 1.5% reducing sugar and 0.03% non reducing sugar.

Protein

Proteins are vital biomolecules that catalyze reactions, regulate gene expression, form cellular structures and support immunity and muscle function. The grains contains approximately 7% protein, though reported values range from 5.6 to 12.7% depending on genotype and environment (Joshi and Katoch, 1990; Ravindran, 1991; Antony *et al.*, 1996; Vadivoo *et al.*, 1998; Mushtari, 1998; Bhatt *et al.*, 2003). Singh and Srivastava (2006) observed protein levels between 4.88-15.58% across 16 varieties, while Kazi *et al.* (2022) reported 3.55-9.90% in 64 landraces. Brown seeded types generally show higher protein content than white types (Vadivoo *et al.*, 1998). Prolamin is the major protein fraction, accounting for 24.6-36.2% of total protein (Lupien, 1990) and soluble proteins are present at 99.1 mg/100 gm (Antony and Chandra, 1998).

The grain is notable for its essential amino acid profile, contributing 44.7% of total amino acids compared to 33.9% in many cereals (Mbithi-Mwikya *et al.*, 2000). Key amino acids include tryptophan, threonine, valine, isoleucine and methionine (Thaguna *et al.*, 2022). These play roles in muscle repair, bone development, metabolism, nitrogen balance and antioxidant production (Zhang *et al.*, 2017; Singh *et al.*, 2012; Fathima, 2023). Methionine, often deficient in other cereals, provides sulphur for glutathione synthesis, the body's natural antioxidant. Lecithin and methionine also aid in cholesterol regulation by reducing liver fat (Devi *et al.*, 2014).

At the molecular level, transcription factors such as Opaque2 and PBF regulate seed storage proteins.

Opaque2 modifiers influence lysine and tryptophan metabolism, enhancing nutritional quality (Babu *et al.*, 2015). Orthologs of these genes, along with calcium transporters and calmodulin, have been identified in *ragi* (Reddy *et al.*, 2011; Nigude *et al.*, 2014). Compared to other millets, finger millet provides higher levels of valine, threonine and lysine, while tryptophan contributes to appetite regulation and weight management (Asritha, 2021). Its combination of protein, amino acids and fibre underscores its role as a functional food supporting metabolic health.

Crude fibre and fatty acids content

Dietary fibre, though indigestible, plays a crucial role in regulating blood sugar, satiety and digestive health. Crude fibre in *ragi* has been reported between 1.2-1.4% (Seetharam, 2001), 1.3-1.8% (Bhatt *et al.*, 2003; Singh *et al.*, 2003; Malleshi and Desikachar, 1986; Lupien, 1990), 2.1% (Antony *et al.*, 1996), 3.6% (Kamath and Belavady, 1980) and 3.7% (Joshi and Katoch, 1990). Total dietary fibre (TDF) is reported at 12%, with insoluble dietary fibre (IDF) at 11% and soluble dietary fibre (SDF) at 2% (Ramulu and Rao, 1997). The grain contains about 18.6% dietary fibre, comprising 5.1% non cellulosic polysaccharides, 4.7% cellulose and 7.9% lignin (Kamath and Belavady, 1980). Compared to other cereals, *ragi* has ~22% more fibre, with wheat, rice, maize and sorghum containing 12.6%, 4.5%, 13.4% and 12.8% respectively (Klopfenstein, 2000). High fibre intake is associated with delayed nutrient absorption, reduced blood lipids, protection against colon cancer and improved intestinal mobility (Tharanathan and Mahadevamma, 2003). Its gluten free nature also makes it suitable for individuals with gluten sensitivity (Hulse *et al.*, 1981; Reed, 1976; Subbarao, 2002).

Lipids, though present in low amounts, contribute to energy metabolism and cellular function. Total lipid content in *ragi* is reported at 5.2% (free lipids 2.2%; bound lipids 2.4%; structural lipids 0.6%) (Sridhar and Lakshminarayana, 1994). Fatty acid composition shows 25.6% saturated and 74.4% unsaturated fatty acids, with oleic acid, palmitic acid and linoleic acid as major components and linolenic acid as minor (Sridhar and Lakshminarayana, 1994). Black finger millet contains 8.71 mg/gm dry weight fatty acids and 8.47 mg/gm dry weight protein (Gupta, 2014). Non polar lipids account for 80%, glycolipids 6% and phospholipids 14% (Antony *et al.*, 1996). The high proportion of polyunsaturated fatty acids enhances its nutritional quality.

Minerals

Minerals are essential dietary components, supporting bone formation, muscle and nerve function, water balance and the activity of hormones and enzymes. This millet exhibits higher ash content than many cereals, ranging from 1.7-4.13% (Rao *et al.*, 1973; Singh and Srivastava, 2006), with most studies reporting 2.1-2.7% (Samantaray and Samantaray, 1997; Bhatt *et al.*, 2003; Mushtari, 1998;

Malleshi and Desikachar, 1986; Lupien, 1990). Sixteen varieties showed ash values between 1.47-2.58% with a mean of 2.11% (Singh and Srivastava, 2006). Environmental and genetic factors strongly influence mineral content (Kazi *et al.*, 2017). *Ragi* flour was successfully used to prepare acceptable nutritious cookies by replacing refined flour up to 50%, while also improving mineral, fiber, calcium, iron, phosphorus, copper and zinc content (Sinha and Sharma, 2017).

Calcium is the most abundant mineral in ragi. Across 36 genotypes, calcium ranged from 162-487 mg/gm with a mean of 320.8 mg/gm (Vadivoo *et al.*, 1998). White varieties averaged 329 mg/gm compared to 296 mg/gm in brown types (Seetharam, 2001). Bhatt *et al.* (2003) reported 344 mg/gm, while some germplasm lines reached 450 mg/gm (Panwar *et al.*, 2010). This millet contains 5–30 times more calcium than other cereals (National Research Council, 1996), making it a natural source for preventing osteoporosis and supporting bone health (Desai *et al.*, 2010). Transcriptome studies have identified calcium transporters, calmodulin and Ca dependent protein kinases as regulators of grain calcium accumulation (Kumar *et al.*, 2014; Singh *et al.*, 2014; Sood *et al.*, 2016).

Iron content varies widely, from 3.3-14.8 mg/gm (Babu *et al.*, 1987). Sixteen varieties showed 3.61-5.42 mg/gm with a mean of 4.40 mg/gm (Singh and Srivastava, 2006). Ragi is recognized as an excellent natural source of iron, effective in improving anaemia (Kaur *et al.*, 2022). Zinc ranged from 0.92-2.55 mg/gm (mean 1.34 mg/gm), while phosphorus ranged from 130-295 mg/gm (mean 180.43 mg/gm) (Singh and Srivastava, 2006). Ragi also contains potassium, magnesium, copper, sodium and phosphorus in significant amounts (Obilana *et al.*, 2002). Magnesium content ranged from 142 to 193 mg/100 g, with KFMG 2239 lowest, KFMG 2262 highest and Phule Nachani and Phule Kasari at 167 and 156 mg/100 g, respectively (Ghogare *et al.*, 2025).

The grain flour, rich in calcium, iron and amino acids, is widely used in porridge, dosas and roti (Shobana *et al.*, 2013). Its nutritional value makes it suitable for infant weaning foods and contributes to livestock feed (Kumar *et al.*, 2012). With higher potassium (344 mg/gm) and calcium (408 mg/gm) compared to rice, ragi supports teeth and bone health and offers protection against malnutrition, diabetes and hypertension (Jayawardana *et al.*, 2022; Shobana *et al.*, 2013).

Vitamins

Vitamins are essential for biological processes such as immunity, wound repair, bone development and hormone regulation. This millet is a good source of B complex vitamins, including thiamin, riboflavin and niacin, as well as tocopherols (vitamin E) (Obilana and Manyasa, 2002). Both water soluble and fat soluble vitamins have been reported, including vitamin C (ascorbic acid) and vitamin E (Serna-Saldivar *et al.*, 1995).

Table 2: Nutritional composition of finger millet.

Nutrient (Unit)	Amount
Energy (Kcal)	336
Protein (gm)	7.7
Fat (gm)	1.5
Carbohydrates (gm)	72.6
Fibre (gm)	11.5
Calcium (mg)	350
Phosphorus (mg)	283
Iron (mg)	3.9
Zinc (mg)	2.3
Sodium (mg)	11
Potassium (mg)	408

Source: Porwal *et al.* (2023).

Carotene content has been reported at 45 µg/100 gm (Gopalan *et al.*, 1999), though other studies found lower β carotene levels of 0-1 µg/100 gm (Bhaskaracharya, 2001). Vitamin A values vary: Edu NAP (1996) reported six retinol equivalents, while Ramashia *et al.* (2019) found 6.0 mg/100 gm. Vitamin C content has been reported between 0.0-1.0 mg/100 gm (Shobana *et al.*, 2013).

This millet also contains nitriloside (vitamin B17), a compound noted for selective toxicity against cancer cells, suggesting potential therapeutic applications without adverse side effects. Its vitamin profile, combined with high mineral and fibre content, enhances its role as a functional food for health promotion.

The nutritional composition of grains is presented in Table 2. It contains 336 kcal energy, 7.7 gm protein, 1.5 gm fat, 72.6 gm carbohydrates, 11.5 gm fibre, 350 mg calcium, 283 mg phosphorus, 3.9 mg iron, 2.3 mg zinc, 11 mg sodium and 408 mg potassium per 100 gm (Porwal *et al.*, 2023).

Molecular characterization

Initial molecular characterization of finger millet relied on RAPD markers, which provided a rapid and economical means of assessing genetic variability among landraces and cultivated types. These studies revealed substantial polymorphism and established foundational diversity patterns (Jadav *et al.*, 2023). With methodological advances, SSR markers became widely adopted due to their reproducibility and codominant inheritance, enabling finer discrimination among accessions. Extensive SSR based analyses highlighted pronounced differences between Indian and exotic germplasm, generating valuable insights for breeding programs (Babu *et al.*, 2017).

ISSR markers were subsequently applied to traditional cultivars and hybrid lines, confirming the broad genetic base and adaptability of ragi across diverse agro climatic regions (Venkatesan *et al.*, 2021). Genome wide studies using high throughput genotyping and conserved germplasm collections at ICRISAT further clarified

population structure, genetic variation and evolutionary dynamics, reinforcing the crop's resilience and nutritional importance (Backiyalakshmi *et al.*, 2021). More recently, integration of biochemical profiling with molecular marker analyses has linked nutritional traits, such as protein content, amino acid composition and antioxidant activity to genetic diversity, aiding the identification of superior landraces for functional food development (Solanki and Patel, 2023). Omics driven approaches, including genomics, transcriptomics and molecular breeding, now provide a strong foundation for trait improvement and sustainable nutritional security (Kayastha *et al.*, 2024).

Functional SSRs have also been developed to explore variation in opaque2 (o2) modifiers influencing tryptophan concentration. Babu *et al.* (2014) created 67 SSRs from EST sequences of maize and sorghum o2 modifiers, transcription factors and candidate genes in lysine and tryptophan pathways. Using these markers, Sood *et al.* (2016) classified 190 global genotypes into three clusters: Cluster A with medium tryptophan (0.70-0.85%), Cluster B with high levels (>0.85%) and Cluster C with mostly <0.7%. A few genotypes, including IE5106, IE6350, GE4449, VHC3903, VHC3870 and GE4811, exhibited ~0.9% tryptophan, highlighting their potential as nutritionally superior breeding material (Sood *et al.*, 2016).

Antioxidant activity

Dietary antioxidants protect cells from oxidative damage by scavenging free radicals, thereby reducing the risk of chronic diseases such as cardiovascular disorders and cancer. Major plant-derived antioxidants include carotenoids, polyphenols and vitamins C and E (Manach *et al.*, 2004; Baiano *et al.*, 2016). Finger millet is rich in bioactive compounds such as phenols, tannins, phytates, flavonoids and enzyme inhibitors, which are now recognized for their nutraceutical and antioxidant properties (Thompson, 1993). Phenolic compounds, particularly tannins, are abundant in grains of ragi (Ramachandra *et al.*, 1977; Serna-Saldivar *et al.*, 1995; McDonough *et al.*, 2000) and exhibit strong free radical scavenging activity (Subbarao *et al.*, 2002; Sripriya *et al.*, 1996), contributing to protection against cancer, cardiovascular diseases and ageing-related disorders (Bravo, 1998; Rice-Evans *et al.*, 1997; Scalbert *et al.*, 2005).

Tannin content varies widely among grain types, with higher levels in red-brown grains than white grains (Asquith and Butler, 1986). This millet also contains phytates (0.48%), trypsin inhibitors (0.61%), dietary fibre and carotenoids, further enhancing its antioxidant potential (Mathanghi, 2012). Animal studies have confirmed its ability to reduce oxidative stress (Rajasekaran *et al.*, 2004), while malted ragi beverages also possess high antioxidant activity (Chandrasekara *et al.*, 2010). These properties highlight the importance of conserving finger millet landraces as valuable nutritional resources (Kazi *et al.*, 2022).

Antidiabetic activity

Diabetes mellitus is a chronic metabolic disorder caused by impaired insulin secretion, insulin action, or both. It is a major global health concern and is associated with reduced life expectancy, renal failure, blindness and substantial socioeconomic burdens (Patel *et al.*, 2012; Keerthana *et al.*, 2013). Ragi exhibits significant anti-diabetic potential due to its high dietary fibre, flavonoids and polyphenols, which help reduce hyperglycaemia and oxidative stress (Devi *et al.*, 2014). It also contains trypsin inhibitory factors and phytic acid (0.48% each), which lower the glycaemic index by reducing intestinal absorption of proteins and carbohydrates (Devi *et al.*, 2014). Furthermore, this millet modulates gut microbiota by promoting beneficial microorganisms and suppressing harmful microbes, thereby enhancing its anti-diabetic effects (Sarma *et al.*, 2018).

CONCLUSION

Finger millet is a nutrient-rich and climate-resilient food grains with immense potential to improve global food and nutritional security. It is an excellent source of calcium, iron, dietary fibre, essential amino acids and bioactive compounds, making it a valuable functional food. Its health-promoting properties help reduce the risk of diabetes, cardiovascular diseases and oxidative stress. The crop is well adapted to marginal lands, requires low agricultural inputs and performs well under drought conditions, making it suitable for climate-smart agriculture. Its rich genetic diversity, supported by advances in molecular breeding and genomics, offers significant opportunities for developing high-yielding and nutrient-dense cultivars. Conservation of finger millet landraces and promotion of value-added products will enhance its utilization and commercial importance. Therefore, continued research, genetic improvement and wider cultivation of this millet are essential for achieving sustainable agriculture, improving rural livelihoods and ensuring future food and nutritional security.

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Disclaimers

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Informed consent

Not applicable. This article is a review based entirely on published literature and does not involve human participants, animal experiments, or clinical studies.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. The funding agency had no role in the conceptualization, literature collection, interpretation of published findings, preparation of the manuscript, or the decision to publish this review article.

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