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A review on finger millet: Its nutritional value, bioactive compounds, processing and value-addition

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Abstract
Ragi (*Eleusine coracana)* is an ancient cereal grain that is mostly produced in Africa and Asia. It is well-known for its high nutritional content and adaptability, making it an important crop for food security and health promotion. Finger millet is high in key macronutrients like carbs, proteins, and fibre, as well as micronutrients like calcium, iron, and zinc. It also contains bioactive chemicals including as polyphenols and flavonoids, which have anti-inflammatory and antioxidant properties. These nutrients help finger millet to promote digestion, manage blood glucose levels, and boost overall cardiovascular health. Because of its gluten-free nature, finger millet has became famous as a nutritious food option for persons suffering from gluten sensitivity or celiac disease. Its low glycaemic index and strong satiety value make it an excellent choice for diabetes management and weight loss. Finger millet farming is noted for its adaptability to unfavourable environmental conditions such as drought and low soil fertility, making it an appealing crop for smallholder farmers. Furthermore, its short growth season and efficient water use contribute to its sustainability and adaptability to climate change.

Keywords: Finger millet, nutrients, health benefits, processing, value added products, bioactive compounds

1. Introduction
Millets are a type of small-grained, warm-weather annual cereal that belongs to the grass family or the poacea family. There are numerous types of millet (pearl millet, kudo millet, finger millet, foxtail millet, and small millet) that are drought tolerant in nature. These are currently used for a variety of food and nonfood applications. Bread, cookies, muffins, chapati energy bar, and biscuits are examples (Hassan et al., 2002) [13]. Millets are important in subtropical and tropical regions of world due to diseases and resistance to pests. Finger millet, it is also known as *Eleusine coracana*. It is the one of important millets in the world and one of the common millets that present several regions of India. In India commonly finger millet known as ragi and Mandau. It is widely grown throughout most of India and Africa. Finger millet is grown in 25 Asian and African nations, accounting for approximately 12% of millet crop land. In India, finger millets crop production covers 1.19 million hectares with a yield of 1.98 million tons, giving an average yield of roughly 1661 kg per ha (Jagati *et al*., 2021) [15]. The area food that provides a significant share of calories and proteins to vast sectors of the population in these countries, particularly low-income people
(Kumar *et al*.,2021) [21]. With nearly 60% of global output, India is the world's top producer of finger millet. Despite the fact that South Karnataka is the largest producer of finger millet, accounting for 58% of global production, just a small fraction of Indians is aware of its health and nutritional benefits. Finger millet is ranked fourth in the world, with India being sixth in terms of production (Chandra *et al.*,2016) [6].
Finger millet it is small seeded (1.2- 1.8 mm diameter) mostly spherical or round shape, having light brown or brick red colored seed coat with the thin membranous pericarp. The embryo and endosperm of the Finger millet are covered by the seed coat, which is known as the test (Ashik *et al.*,2022) [3]. Finger millets are available in a range of colors, including white, tan, red, yellow, violet, and brown. Red finger millet is widely grown and cultivated in nations such as Sri Lanka, Nepal, Madagascar, Uganda, Japan, and different parts of Africa and Asia. Milling, malting, fermentation, popping, and decorating are all steps in the production process. Finger millet is used to make noodles, vermicelli, pasta, Indian sweet (halwa), papads, soups, and pastry goods. Minor millet is utilized in the production of geriatric, neonatal, and health food in both natural and modified forms (Ramashia *et al.*,2019) [25]. The nutritional value of finger millet is high.

It contains carbs, protein, fiber, calcium, iron, and minerals like as magnesium, manganese, and phosphorus, which help to lower the risk of heart disease. Phosphorus is also vital for the development of body tissues and energy metabolism. Finger millet is also high in phytochemicals, such as phytic acid, which lowers cholesterol, and phytate, which helps to decreases the risk of cancer, control weight, diabetes, and cool the body temperature (Chanddra *et al.*, 2016) [6]. It contains beneficial compounds like as ferulic acid, quercetin, and ferulic rich arabinoxylans or exams. It also has essential health benefits such as antioxidative, anti-inflammatory, atherosclerotic, inflammatory, atherosclerotic, and anti-microbial characteristics. Another essential factor is that finger millets are gluten free, thus they can be consumed by persons who are gluten intolerant or have digestive issues. Because ragi is high in ion, it aids in iron insufficiency, particularly in women and adolescent girls. Thus, ragi has demonstrated its nutritional value as a functional ingredient in the formulation of foods for children, pregnant women, the sick, and the elderly. It also has a low glycemic index and controls blood glucose levels. The finger millet is a versatile ingredient that has numerous health benefits (Vijayakumar *et al*.,2020) [34].

2. Nutritional value of finger millet

In assessment to other important crops such as cereals, wheat, and rice, finger millets is high in micronutrients such as vitamins and minerals. Finger millet has the most calcium (220-450), dietary fiber (19.1%), proteins (7.3%), carbs (72.6%), minerals (3%), phytates (0.48%), tannins (0.61%), phenolic compounds (0.3-3%), and trypsin inhibitory factors (Gull *et al*.,2014) [12].). It has a well-balanced protein profile because it includes more lysine, threonine, and valine than other millets. Isoleucine (4.4 g), leucin (9.5 g), methionine (3.1 g), and phenyl alanine (5.2 g) are key amino acids found in finger millet that are lacking in other starchy foods. (Amir gull *et al.*,2014) [10].

Table 1: Nutritional values of finger millet

Sl. no.	Nutrients	Amount
1	Carbohydrates (g)	72.6 g⁄100 g
2	Proteins(g)	7.3 g⁄100 g
3	Fat (g)	1.3 g⁄100 g
4	Crude fiber (g)	3.6 g⁄100 g
5	Ash(g)	3 g⁄100 g
6	Calcium(g)	344 g⁄100 g
7	Iron(g)	3.9 g⁄100 g
8	Zinc(g)	2.3 g⁄100 g
9	Thiamin(g)	0.42 g⁄100 g
10	Riboflavin(g)	0.19 g⁄100 g
11	Niacin(g)	1.1 g⁄100 g
12	Phosphorus(g)	250 g⁄100 g
13	Manganese(mg)	3.5 g⁄100 g
14	Magnesium(mg)	130 ⁄100 g

2.1 Carbohydrates

The carbohydrates in finger millet are made up of 59.4-70.2% starch. Granules of finger millet starch form a polygonal rhombic shape. Amylopectin accounts for 80-85% of the starch, with amylase accounting for the remaining 15-20%. Finger millet contains 1.04% free sugars. According to the other study, finger millet has 59.5-61.2% starch, 6.2-7.2% pentosans, 1.4-1.8% cellulose, and 0.04-0.6% lignin. The dietary fiber content is significantly higher than that of brown rice. Finger millet has less carbohydrate than polished rice (Vijayakumar *et al*., 2020) [34].

2.2 Protein

In necessary amino acids of various sorts, low protein content of 5% and high protein content of 12% have been reported; the protein content of finger millet averages between 6% and 8%. Prolamins and glutelin are the primary protein elements of finger millet (Devi *et al*., 2014) [8]. When compared to other millet, finger millet has a more balanced nutritional profile. It contains 44.75% essential amino acids, which is more than the FAO reference protein's value of 33.9%. Finger millet is considered superior because it has a large amount of valine, lysine, and threonine, as well as a percentage composition of sulfur-containing amino acids comparable to milk (Nayik *et al*., 2014) [12]. Amino acids plays an important role in body function and repair of tissues. Tryptophan, valine, isoleucine, methionine, and threonine are all found in finger millets. Amino acids boost the body's metabolism, aid in muscle and tissue regeneration, and contribute to the balance of nitrogen levels in the body (Dev *et al*., 2014). Isoleucine aids in muscle regeneration; blood production aids in bone growth and skin recovery. Methionine, an essential amino acid, helps to facilitate many functions and processes in the body and acts as a Sulphur provider for the body, which is required for the formation of natural antioxidants. glutathione (Devi *et al.*,2014) [8]. Isoleucine aids in muscle repair; blood production aids in bone growth and skin regeneration. Methionine, a vital amino acid, aids in the excretion of excess fat and acts as a Sulphur provider for the body, which is required for the formation of natural antioxidants. glutathione **(**kumar *et al*,.2021) [17].

2.3 Lipids

The lipids in finger millet are primarily triglycerides, which reduce the risk of duodenal ulcers. Finger millet has a lipid concentration of 1.5%. Oleic acid (49%), linoleic acid (25%). The millet's main fatty acids are palmitic acids (25%). Neutral lipids account for 72% of total lipids. 13% are glycolipids, while 6% are phospholipids (Nayik *et al*.,2014) [12].

2.4 Vitamins and Minerals

Finger millet contains both lipid-soluble and water-soluble vitamins. The water-soluble B vitamins in finger millet, as well as germ and lipid-soluble vitamins, are concentrated in the aleuronic layer (Krishnan *et al*., 2010) [16].

In finger millet high amount of ash is present compare to other cereals. High amount of calcium and iron present in the finger millet (Shobana *et al.*,2013) [28]. Iron deficiency causes anemia, whereas calcium deficiency causes tooth and bone disorders. According to research, the typical ash percentage of finger millet is between 2.1-2.7%. The germ, aleurone layer, and pericarp of finger millets contain the most minerals. Antinutritional components such as oxalic acid, phytic acid, and tannins may limit divalent metal ion bioavailability **(**Saleh *et al.*,2013) [27].

3. Anti-nutritional factors

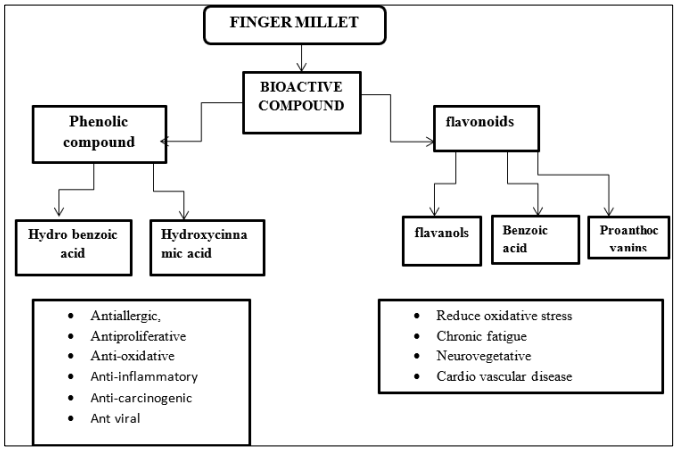
Phytate, tannin, and trypsin are anti-nutritional agents found in finger millet. Tannin (0.04-3.47%), phytate (0.48%), oxalate (0.27%), cyanide (0.17%), saponins (0.36%), and polyphenols are all present. Anti-nutritional components are reduced in finger millet after roasting, soaking, boiling, parboiling, fermentation, milling, germination, decortications, and

extrusion heating. Tannin content affects protein digestibility, feed intake, and development rate, while a high tannin diet reduces microbial enzyme activity and intestinal cellulose breakdown. Tannin is also a type of antioxidant (Swati *et al.*, 2021) [20]. Tannin protects our cells by neutralizing pollutants. Another study found that tannin in the grain's outer layer functions as a fungal barrier. Tannin is also multifunctional, acting in reducing agents as free radical terminators, metal chelators, and singlet oxygen quenchers. Radical scavenging activity outperforms wheat, rice, and other millets (Sebola *et al.*,2021) [11].

4. Bioactive compound of finger millet

The bioactive compound present in the finger millet is nutritionally important that several studies are reported. These compound which are clustered around plant nutrients such as dietary fiber (and polyphenols those are show the potential nutraceutical strength through their participation in several biological systems (Udoh *et al.*,2017) [5]. In another study shown that the phenolic compound is present in all type of millet and it is connected to different parts of cell wall by glycosidic link, like arabinoxylans and protein. In finger millet seed coat wall bound form of bioactive phenolic is not present (Thagunna *et al*,.2022) [31].

4.1 Polyphenols



Several studies have found that bioactive phytochemicals are beneficial to human health. Polyphenols are antioxidants obtained from plants that are naturally occurring and have health advantages. Polyphenols act as antioxidants in the body, protecting it from oxidative stress and lowering the risk of noncommunicable diseases such neurovegetative cardiovascular disease, chronic fatigue syndrome, and sickle cell anemia. Other polyphenolic capabilities include illness prevention and neuroprotection (Singh *et al.*, 2015) [34]. Eating finger millet lowers the risk of cancer, diabetes, high blood pressure, high cholesterol, inflammatory diseases, metabolic syndrome, Parkinson diseases, antibacterial, wound healing properties, DNA damage protective activities, and gastro intestinal diseases (Tamilselven *et al.*, 2020) [34].

4.2 Flavonoids

Flavonoid compounds are abundant in finger millet. When compared to other millets, finger millet flavonoids are mostly found in soluble form and in higher concentrations (2100 g/g). Millet flavonoids include quercetin, catechin, gallocatechin, epicatechin, and epigallocatechin (Mrinal *et al.*,2022) [26].

5. Health benefits of finger millets

Finger millet good source of micro and micro-nutrients it is an essential staple food for people who are from low economic status, low income and also good for people who having diabetes and obesity (Thagunna *et al*,.2022) [31]. Finger millets are rich in protein, oils and minerals than the grains. It is high in micronutrients like as calcium, phosphorus, magnesium, and iron. Cystine, tyrosine, tryptophan, and methionine are among the amino acids found in finger millet. Consumption of finger millet reduces malnutrition, cures degenerative diseases, has nephroprotective characteristics, wound healing capabilities, slows early aging, and anti-cataract genic properties. Green finger millet is very important for people those who having heart problem, liver disorder, blood pressure and asthma **(**Chowdary *et al*.,2020) [7]. High content of calcium is present in the finger millet that helps to reduce the risk of teeth, bone disorder and iron also rich in ragi it helps to reduce risk of anemia, Improvement of the status of children on feeding finger millet. The diet having finger millet it helps to reduce cholesterol, in diabetic reduction of blood glucose by 36%. It also having anti-anti-microbial-microbial, and anti-oxidant activities of its polyphenols have been growing. (Vagdevi *et al.*,2023) [33].

5.1 Cardiovascular diseases

Finger millet contains two major amino acids, methionine, threonine, and lecithin, which serve to eliminate undesirable fat from the liver and lower cholesterol levels while also inhibiting fat accumulation. Because finger millet has a low content of serum triglycerides, its ingestion reduces the risk of cardiovascular disease by lowering plasma triglycerides (Mrinal *et al.*,2022) [26].

5.2 Diabetes

Finger millets include phytochemicals and a high fiber content. Phytochemicals help to manage blood sugar levels by slowing digestion and increasing antioxidant levels in the body. The phenolic episperm of finger millet acts as an inhibitor, reducing postprandial hyperglycemia by limiting the role of enzymes such as amylase, alpha, glucosidase, and others (Rathore *et al.*,2019**)** [23]**.** Another study found that finger millet has a low glycemic index and antinutritional elements that limit starch digestion and absorption **(**Sumathi *et al.*,2002) [19].

5.3 Anemia

Because finger millet is high in iron, it should be included in your diet to help you recover from anemia and malnutrition. Propagation and fermentation of finger millet improved bioavailable iron absorption in one study (Sumaira *et al*., 2022) [13]**.** Finger millet is excellent plant source of natural iron. **(**Shobana *et al*,.2013) [28]. Mainly germinated finger millets foods and products showed improvement on hemoglobin.

5.4 Antioxidant property

Finger millet containing higher antioxidant capacity, high phenolic content and flavonoids such as catechin, gall catechin, epicatechin, procyanidin, dimmer, level of enzymatic (Catalase, superoxide, dismutase, glutathione peroxidase, and glutathione reductase) and non-enzymatic anti-oxidants like glutathione, vitamin E and C (Kumar *et al*., 2021) [21].

Antimicrobial activity

Polyphenol extract from the episperm of finger millet that is

efficacious against Bacillus cereus and Aspergillus Niger, as well as fermented finger millet, inhibit the evolution of Salmonella supercherie coli **(**Shobana *et al*,.2013) [28].

5.5 Anticancer or free radical scavenging

The brown finger millet containing 96%phinolic acid compared to the white. there fermentation or germination the process of brown finger millet decreased the free radical quenching action and it is also efficient in free radical quenching (Yousaf *et al.*,2021) [35].

5.6 Anti-aging

Finger millets are strong in antioxidants and phenolics, both of which are beneficial to health, aging, and metabolic syndrome. Finger millets also connect collagen and glycation, two factors that contribute to individual aging. In other research, finger millet has been proven to slow the aging process by softening elastic tissues like tendons, skin, and blood vessels (Anil *et al.*,2021) [17].

5.7 Celiac disease

Celiac disease is a gluten-sensitive immune-based disease caused by gluten absorption in genetically predisposed individuals. Because finger millet is gluten-free, it is a viable option for celiac disease patients and gluten-sensitive people (Chanddra *et al.,* 2016) [6].

5.8 Wound healing property

Finger millet extract improves this impairment by increasing nerve growth factor synthesis and enhancing antioxidant status. In other trials, epithelialization, enhanced collagen synthesis, and fibroblast and mast cell activation were seen ().

5.10 Anti-ulcerative property

Finger millet included diet helps to prevent the mucosal ulceration (Hegde *et al.,*2002). The consumption of finger millet aids in the prevention of mucosal ulcers. Another study discovered that finger millet, which contains a high cellulose content and insoluble fiber that helps bulk the stool, acts as a laxative to enhance intestinal motility and avoid constipation by keeping water in the stools and increasing peristalsis **(**Mrinal *et al*.,2022) [26]. Polyphenol present in the finger mill*et al*so help to reduce peptic inflammation and show the anti-ulcerative characteristics (Sumaira *et al*.,2022) [14].

6. Processing of finger millets

Finger millet processing, like other cereal grains, involves some basic procedures of primary processing, such as washing, grading, separation, and removal of undesired elements such as stones, soil particles, stalks, chaffs, grains from other crops, and so on. Food processing methods have evolved over millennia, so the end product should be more appealing in terms of look, flavor, taste consistency, and so on. The method's goal is to keep food safe and extend its shelf life (Somarajan *et al.*,2022) [3].

6.1 Milling

Before eating little millet with a lot of husk and bran, it must be dehusked and debranched. Some nutrient-rich grain components, such as the germ and aleurone layer, are somewhat displaced, resulting in a nutrient-deficient product. To complete the process, milling machinery is utilized, and the millet is generally processed into powder form. Plate mills are used to grind the millets into powder, and the whole meal is used in traditional culinary preparation. Normally, wet and dried grain is pounded with a wooden or stone mortar (Ahmad N *et al*,.2013) [27]. Grain moistening with 10% water aids in the easy removal of fibrous husk. Making finger millet flour by moistening, grinding, and sifting. Millets are soaked overnight or for a longer period of time in wet milling before being ground into a paste by hand, sometimes between two stones. Milled grains quickly hydrate and cook to a soft texture in a short amount of time. Because of the grinding action of roller mills, some starch granules are damaged during milling. The granules of starch are relatively resistant to enzymes such as amylase. Increased starch damage to granules reduces flour's water binding power, resulting in lower product quality. (Sing *et al.*,2012) [26]. In one study shows that using of pulverized millet or whole meal is used for the processing dietary products the seed coat of finger millet that presences lead to dark chewy textures for food that the reason of removal of seed coat during processing (Swati *et al.*,2021) [20].

6.2 Roasting

Traditional grain roasting is used to enhance flavor. It also eliminates antinutritional elements, harmful effects, and increases storage life. The roasting and grinding processes make grain digestible while retaining nutrients. Puffing and roasting are nearly identical processes, however the size increases in puffing are greater. Roasting reduced the viscosity of finger millets by 50-60% while having no effect on the proximate composition (Prasad *et al,*.2014) [12]. Another study found that inactivating lipase in millet roasted at 970 degrees Celsius reduced fat breakdown. Weaning dishes made from roasted barnyard and finger millet improves iron bioavailability (Raghuvanshi *et al*., 2012) [25].

6.3 Fermentation

Fermentation is a metabolic process that uses microorganisms to transform complicated materials into simpler forms. Fermentation is the oldest and most successful method of food preparation and preservation (Teena *et al.*,2019) [23]. During fermentation, processes occur that cause an increase in amino nitrogen, protein breakdown, and the removal of any inhibitors that may be present. Finger millet's lysin concentration rises after fermentation. Lactobacillus salivaricus fermentation boosts lysine and tryptophan levels in millets by 17.8 and 7%, respectively (Rathore *et al.,* 2019**)** [23]**.** Fermentation also enhances the availability and accessibility of minerals such as calcium (20%), zinc (26%), phosphorous (26%), and iron (27%). Fermentation also raises amino acid levels such as niacin (4.2 mg/100 g), pantothenic acid (1.6 mg/100 g), and riboflavin (0.62 mg/100 g), which are higher than in raw finger millet. Fermentation is a crucial stage in the production of porridge. Baked and fried pancakes, as well as beverages. Fermentation increases protein digestibility by decomposing complex storage proteins using microbial enzymes. Amylotic assault is also possible since acid generation and soaking increase *in vitro* digestibility after fermentation (Ashik *et al.*,2022) [3].

6.4 Germination/Malting

The most common method in India is finger millet germination. Germinated finger millet contains more nutrients than germinated maize and germinated sorghum. Germination is immune to fungal infection. Another study found that finger

millet had stronger amylase activity than other millets and that it takes 4-5 days to acquire maximum amylase activity. Germination also increases nutritious factors while decreasing anti-nutritional factors such as phytic acid, trypsin, and tannin. It also improves the bioavailability of nutrients found in finger millet, such as calcium, iron, and zinc. (Eugenia *et al.*,2019) [24].

6.5 Popping

Popping is a traditional way of preparing popped finger millet. After popping, the finger millet grain transforms into a pourable, crunchy, and easy precooked instant product with a nice and acceptable flavor and taste (Sharma *et al.*,2016). Millet is blended with 3-5% more water and tempered for 2-4 hours during this process. A high temperature and short time method of agitation in sand to about 2300 C was used. The process provides a very appealing fragrance due to the Millard interplay between sugars and amino acids. Popped finger millet is already cooked and ready to eat (Shobana *et al.*,2013) [28]. Another study found that popped grains are particularly fibrous because the bran of the grain is difficult to remove after popping. The popped millet has a low bulk density, an appealing texture, and a distant flavor. Increased starch digestion ability improves grain enzymatic digestion by causing high levels of Starch gelatinization and debonding of starch granules from protein. (Kumar *et al.*,2021) [21].

6.6 Decortication

This is a relatively new method for finger millet. It is also referred to as debarking. This was the strategy used for the majority of the cereals. However, because the seed coat of finger millet is still linked to the weak endosperm, it is ineffective. Hypothermal processing is used to beautify finger millet. This involves hydrating, heating, and drying the grain, which hardens the endosperm and helps it to withstand mechanical impact. Decorticated finger millet is cooked in the same manner as rice. Another study found that the decortication procedure boosts the product's source of health-promoting substances such as phenolic compounds, minerals, and dietary fiber (Manideep *et al.*,2020) [8].

Table 1: Value added products of finger millets

Product	Composition	Aim of study	Significant findings	Reference
Finger millet cookies	Finger millet: 10-30%	Aim of this study is evaluation of quality and formulation of finger millet fortified cookies	• The study shows that the cookies with (80:20) was better • The shelf life of prepared cookies is 60 days. • The study shown that the addition of finger millet has a very potential for the preparation of fortified cookies • When the quantity of finger millet flour increases that effect on the sensorial parameters.	(Bhoite *et al.*, 2018) [6]
Papad	Finger millet flour – 15-20%	Aim of the study was papad is prepared by finger millet flour	• The papad is rich in nationally and good for consume • Ragi papad contain protein:6.64%, CHO:80.76% Energy:368(kcal/100g) Total ash:1.27% Fat:3.45% • Drying of the papad moisture content is 7-8%(db.). • Pericarp of the finger millet is not separated out from the starch it gives the papad little dark color. Then after frying and roasting turns to lighter it provides good in taste	(Vagdevi *et al.*, 2023) [33]
Noodles	Malted ragi: 30% Wheat flour: 70%	Aim of this study was manufacturing noodles from finger millet and increases its nutritional composition	• In this study malted process increases the calcium, phosphorous, and vitamin c content in the ragi flour • Also increases the digestibility and bioavailability of nutrients • A 70:30 flour mixture was chosen for its sensory characteristics, although its look and elasticity were unsatisfactory. • The look has deteriorated due to an increase in the intensity of brown color caused by the increased amount of malted ragi flour. • The lower texture rating is related to a decrease in elasticity caused by the reduced gluten level. • The inclusion of gluten, guar gum, and vegetable oil with 70% wheat flour and 30% malted ragi flour improved the appearance and texture. • The inclusion increases rehydration viscoelasticity, reduces cooking loss, produces a creamy yellow hue, and has a firm and non-sticky mouth feel. • Having a higher protein, fiber, and mineral content than the control sample • The nutrient-dense noodle is beneficial to children, teenagers, and athletes. • It is also easy to consume due to ready to eat form	(Kulkarni et al,.2012) [18]
Weaning food	Finger millet:20-40% Peanut: 20-40% Teff grain:20-40%	The study's goal was to assess the influence of grain teff, finger millet, and peanut blending ratio and processing conditions on weaning meal quality, with three specific goals in mind.	• The proximate composition of finger millet used in weaving food was 11.0% moisture, 1.1% ash, 1.8% crude fiber, 11.1% crude protein, 1.98% crude fat, and 73.1% carbohydrate. • The carbohydrate content is high in comparison to cereals and legumes, indicating the large amount of starch present in finger millet. • The fat content is quite low due to the small germ. • The low-fat content may aid to boost storage stability due to its low tendency to get rancid. • Combining cereals and legume grains improves the nutrient density and sensory quality of food samples.	(Heiru *et al.*,2019) [12]

Chapati(roti)	Wheat flour:70% Finger millet flour: 30%	Aim of the study was prepared nutritional rich chapati by finger millet and wheat flour	• In this study, fortification of finger millet in chapati improves taste while simultaneously controlling glucose levels in diabetes patients. • It slower the digestion rate and bulkiness of the fiber feel full feeling. Therefore, it prevents the excess eating of calories. • The fiber content in finger mill*et al*so helpful to individuals having problem of constipation	(PK Ambre *et al*.,2020) [1]
Ragi Ladoo	Finger millet: 100%	Aim of the study was to evaluate the effect of consumption of finger millet Ladoo on the level of hemoglobin	• The finger millet has rich in iron content • The finger millet ladoo had 95% of moderate anemia whereas the remain 5% sample had mild anemia. • The finger millet ladoo two in number 50g each were provided daily for four continues weeks the the hemoglobin level was reassessed in anemic • Consumption of finger millet in daily bases of group population as it contains a significant range of organic iron ampare to other cereals	(Moharana *et al*., 2020) [21]
Ragi chips	Ragi flour: 20% Rice flour: 20%	Aim of the study is prepared value-added product based on millet basically with ragi flour that rich in calcium, iron, fiber and carbohydrate	• The study found that adding finger millet, which is high in dietary fiber, benefits diabetic patients. • Finger mill*et al*so has a low glycemic index, making it a good late-night snack that also helps to keep blood sugar levels stable.	(Sharma *et al*., 2022) [29]
Ragi soup	Ragi: 60%	Aim of the study was Prepared nutrition rich soup	• Powdered finger millet mixing with the water • Continuedly stirring after the lump formation should not occur leave when the consistency was become smooth and thick • In addition to the above dishes, many more local preparations include finger millet depending on local habits and preferences. • This millet offers a high nutritional value for consumers.	(Gull *et al*. 2014) [10]
Muffins	Ragi: 30% Wheat flour: 30%	Aim of the study was prepared muffins by finger millet flour	• Consumption of finger millet muffins resulted in considerably lower postprandial IR and peak blood glucose levels in prediabetic subjects.	(Ameerah *et al*.,2023) [4]
Biscuits	Wheat flour: 60 Finger millet flour: 40	Aim of the study was developed value added biscuit by finger millet flour	• The biscuit was higher in fiber and good shelf life • In another study the biscuit is made with seedcoat • On the sensory the 10% of seed coat from native and hydrothermally processed millet, • 20% from malted millet this the composition of biscuit flour • The biscuit was crisp texture and good breaking strength	(Sachni *et al*.,2022) [14]

7. Conclusion

Finger millet is a staple grain with a significant potential for population nutrition due to its cheap cost availability and ease of cultivation. It has the highest nutritional and functional qualities of any grain. The presence of dietary fiber and polyphenols in finger millet can assist to reduce health disorders such as diabetes, hypercholesterolemia, prevention of diet-related chronic diseases, antioxidant and antibacterial properties. This contributes significantly to human nutrition due to its vitamins, minerals, fatty acids, and antioxidant capabilities. This grain could be used to augment meals in rural and disadvantaged areas. The bulk of the population is malnourished in terms of energy and protein. Finger millet can be used in a number of foods due to its well-balanced protein content and gluten-free status.

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