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Research Paper

Millets: Developmental Prospects, in relation to providing nutritional nourishment to millions

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Abstract:
The food resources in developing tropical nations is insufficient to meet the needs of both humans and animals in terms of protein. The reduction of land for agriculture, increasing urbanisation, and climate change is also a cause for this scarcity. Globally, millets are a major food crop that have a big economic influence on developing nations and it is also a way overcome this problem. Millets make excellent energy sources. They supply dietary fibre, polyphenols, minerals, vitamins, fatty acids, and protein. A significant concentration of necessary amino acids, particularly those containing sulphur (methionine and cysteine), are found in typical millet protein. Antioxidants like phenolic acids and glycated flavonoids can be found in millet. Hence, foods based on millet are thought to have potential health benefits as probiotics and prebiotics, used as anti-diabetic, anti-obesity drug, used against cardiovascular disease and for certain cancers. It also enhanced the immune system of human beings. When millet is processed, the fibre- and phytochemical-rich bran and germ layers are removed, resulting in a large loss.

Kewwords: *Antioxidants, Millets, Nutritional nourishment, Prebiotic and Probiotics*

I. Introduction

One of the most significant cereal grains is millets. They are primarily grown in marginal areas where major cereals are not productive enough to produce significant yields (Adekunle, 2012). Over one-third of the global population eats millets. In terms of agricultural production worldwide, it ranks as the sixth cereal crop. Millets classified as major and minor millets. Major millets like Pearl millet *(Pennisetum glaucum*), Foxtail millet (*Setaria italica*), Variga (*Panicum miliaceum*, white millet or Proso millet) and Ragi (*Eleusine coracana*, Finger millet). while, Minor millets include Jowar (Sorghum), Sama (*Echinochloa frumantacea*, Little millet), Korra (*Setaria italica*). Barnyard millet (*Echinochloa spp.*), Kodo millet (*Paspalum scrobiculatum*), Little millet (*Panicum sumatrense*), Guinea millet (*Brachiaria deflexa = Urochloa deflexa*), Browntop millet. Bajra (*Pennisetum glaucum*) and Sanwa millet are high in fat while Ragi has the lowest fat. In rural areas, millets are a common food source. They are used all over the world and have been cultivated for a millennium. During the Middle Ages, millets were preferred to wheat for porridge by the Romans and Gauls. The countries of China, India, Greece, Egypt, and Africa produce the majority of the millet crop used for commerce worldwide. However, even in rural areas, some millets-such as finger millet, sorghum, etc. are consumed by humans, while the remainder are fed to animals. Amazing nutritional values can be found in millet. In many areas, millets are an important part of traditional diets. When compared to commonly used rice and wheat, the nutritional content of all millets is three to five times higher. In addition to their nutritional value, millets have been shown to aid in the management of various health issues, including hyperlipidemia and diabetes mellitus (Gowda et al., 2022). Karnataka is the state that produces the most millets in India. Millets account for more than 58% of global production, but very few Indians are aware of their nutritional value and health advantages (Dinesh et al., 2016). According to traditional growing methods, millets don't require pesticides, and the land used to grow them is completely free of pests. Pulses such as green gramme can be stored in pest-free conditions with millets like foxtail millet acting as anti-pest agents. There is no need to use fumigants with millets. Millets can tolerate longer heat cycles and can even grow in droughty conditions. Millets are far superior to wheat and rice in terms of nutrition, growing even without irrigation and during extremely low rainfall regimes of 200–500 mm. Certain millets contain over fifty times the amount of fibre compared to rice. All other millets have at least twice as much calcium as rice, but finger millet has thirty times more than rice (Gowda et al., 2022) . Compared to rice, foxtail and little millet have higher nutritional contents due to their iron content. Millets are a great source of micronutrients, including iron, manganese, phosphorus, magnesium, beta-carotene, vitamin B, and antioxidants. Apart from lysine

and threonine, millets are a good source of essential amino acids. They also contain a significant amount of sulphur, which is linked to amino acids like cysteine and methionine.

Millets are also good source essential fatty acids like linoleic, oleic and palmitic acids found in their free form, while bound form of amino acid also found as monogalactosul, diacylglycerols, digalactosyl diacylglycerols, phosphatidylethanolamine, phosphatdyl serine and phosphatidyl choline. There are trace amounts of other fatty acids, including erucic acid, behenic acid, and arachidic acid. Tocopherols and linoleic acid may be found in millet oil. Gluten-free and alkaline forming, millet is a grain. The presence of vitamin B, including niacin, folacin, riboflavin, thiamine, and phosphorus, in millets is important for the body's energy synthesis and helps combat the obesity and malnutrition that afflict a large portion of the Indian population. This review focused and compiled about types of millets, its nutritional values and its nutritional applications.

II. Types of Millets

2.1. Sorghum or jowar

One of the oldest cereal grains, sorghum is a staple crop in both Africa and India. For those who are sensitive to gluten and have celiac disease, it is regarded as a safe food grain substitute. Because sorghum grain is entirely gluten-free according to molecular evidence, people who are intolerant of gluten prefer it. Grains like wheat, barley, and rye are frequently found to contain gluten, a protein that gives these grains their chewy, springy texture when baked into breads or pastas. Jowar contains high levels of fibre, protein, iron, and calcium. Certain reports indicated that policosanols, which lower cholesterol, are abundant in a typical sorghum wax. It is helpful in weight loss (Laraib et al., 2021; Tripathi et at., 2023).

2.2. Finger Millet

One of the healthiest cereals is finger millet, which also contains a good amount of natural calcium that strengthens bones and lowers the risk of bone fractures. Additionally, it is a good natural iron source that helps with anaemia. It is regarded as a nutritional storehouse that is high in minerals, vitamins, proteins, and amino acids (Laraib et al., 2021; Tripathi et at., 2023). It is an effective laxative and helps avoid constipation because of its high fibre content. Finger millet's high calcium content makes it beneficial for young children, the elderly, and expectant mothers. It also aids in the production of enough breast milk, which makes it very beneficial for nursing mothers. Finger millet is an excellent dietary supplement and treatment for a number of illnesses, including high blood pressure, heart issues, and asthma.

2.3. Pearl millet

Magnesium, which is present in pearl millet, helps asthmatics' breathing issues and lessens the effects of migraines (Laraib et al., 2021; Tripathi et at., 2023). Gall stone incidence is decreased by the fibre content of pearl millet.

2.4. Kodo millet

Kodo millet is a traditional food that aids in weight loss and tastes a lot like rice. It is readily absorbed and high in antioxidants and phytochemicals that help prevent various illnesses like knee and joint pain and help women's menstruation to be regular (Laraib et al., 2021; Tripathi et at., 2023).

2.5. Proso millet

Proso millet helps prevent Pellagra, a condition brought on by the vitamin B3 niacin. Niacin content is high in proso millet. Pellagra is a skin condition that leaves the skin rough, scaly, and dry. Niacin (Vitamin B3) and protein make up proso millet. It has historically been used as healing food, particularly after childbirth or illness (Laraib et al., 2021; Tripathi et at., 2023).

2.6. Foxtail millet

Foxtail millet facilitates the steady release of glucose without interfering with the body's metabolism. Because it is a good source of magnesium, foxtail millet is also known as a heart-healthy food and helps lower the prevalence of diabetes in humans (Laraib et al., 2021; Tripathi et at., 2023)

2.7. Little Millet

Notwithstanding its diminutive size, little millet has a high nutritional content. It is a good source of calcium, iron, zinc, potassium, and B vitamins, among other minerals. Additionally, it gives the body the necessary fats that aid in weight loss. Another benefit is its high fibre content, which makes it perfect for kheer or pongal in place of rice ((Laraib et al., 2021; Tripathi et at., 2023).

III. Nutritional contents of millet grains

Millets has excellent nutritional values as compared to cereals because it content high amount of calcium, dietary fibre, polyphenols and protein (Hassan et al., 2021). Significant amounts of essential amino acids,

especially those containing sulphur, are primarily found in millets (methionine and cysteine); Additionally, their fat content is higher than that of rice, sorghum, and maize. Tryptophan and lysine contents in cereal proteins, including millets, are generally restricted and vary by cultivar. Nonetheless, the majority of cereals include vitamins, minerals, and the essential amino acids (Shah et al., 2021). Millets are an excellent source of micronutrients and phytochemicals. Millets contain various phytochemicals such as carotenoids, phenolics, sterols, lignans, inulin, resistant starch, β-glucan, phytates, and tocopherol. Various component of millets are shown in figure 1.

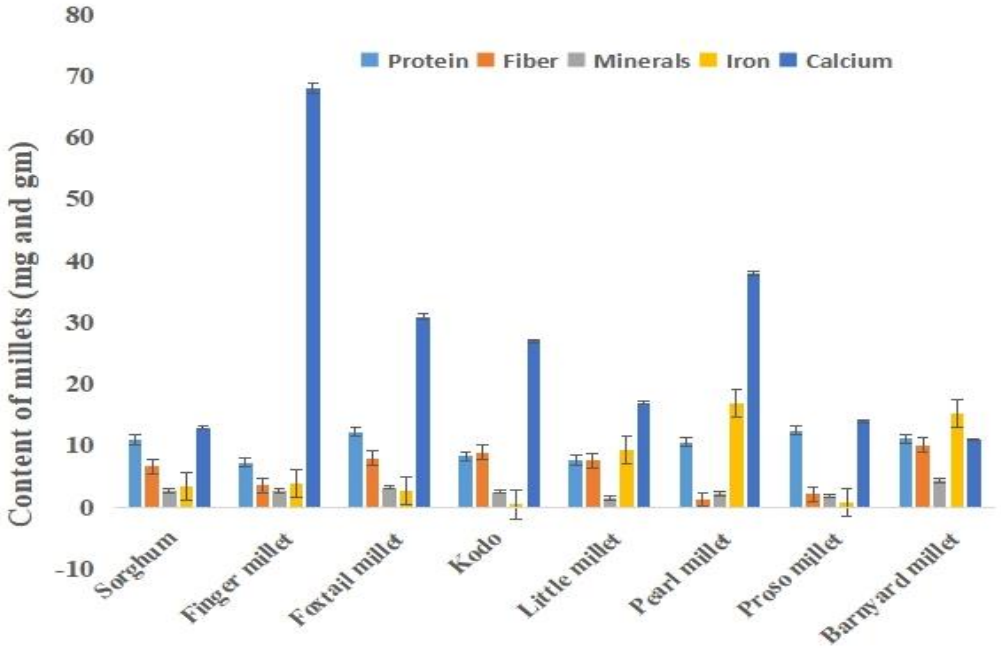

Fig. 1: Nutrient contents of various millets. Protein, fiber, minerals, iron are shown in gram(gm) while calcium are shown in miligram (mg).

Millets contain small amounts of flavonoids, which are polyphenols made up of phenolic acids, tannins, and other compounds that function as antioxidants and support the immune system (Shah et al., 2021). Numerous antioxidants in millet help to eliminate other toxins from the body, including those in the kidney and liver, and counteract free radicals, which can cause cancer (Gong et al., 2018). Through encouraging appropriate excretion and counteracting enzymatic activity in those organs, quercetin, cucurmin, ellagic acid, and a host of other advantageous catechins can aid in clearing the system of any foreign substances and poisons.

IV. Application of millets as nutritional nourishment:

Millets are reported as a major and unique nutritional resources in developing country. Every millets has its own uniqueness. Table 1 nutritional effect of various millets are shown.

4.1. Antimicrobial and anti-inflammatory activity

The secondary metabolites found in millet grains exhibit a diverse range of biological characteristics. Millet varieties' bioactive secondary metabolites, like flavonoids and phenolics, have antifungal and antibacterial properties. The phenolic compounds found in finger millet grains exhibit antimicrobial properties, making them a promising pharmaceutical substitute for treating a range of bacterial and fungal infections.

4.2. Millet in probiotic and prebiotics foods

Probiotics support the natural flora in the colon or help replenish it when illness, chemotherapy, or antibiotics lower the amount of bacteria. The majority of foods containing probiotics produce essential nutrients such as vitamins and fatty acids, which strengthen the body's defence against harmful microorganisms (Abd El-Salam et al., 2012).

Table 1: Major health parameters affected by various millets

Name of the millets	Major health benefits	References

Pearl millet	Reduce the risk of inflammatory bowel diseases, lower triglyceride levels, prevent heart-related diseases, and serve as a natural source of antioxidants	Kim and Je, (2016),
Proso millet	It enhances plasma levels and glycemic responses while safeguarding against liver damage caused on by D-galactosamine.	Hassan et al., 2021
Finger millet	lowering the chance of developing diabetes and gastrointestinal problems, as well as having the capacity to scavenge free radicals	Muthamilarasan, Dhaka, Yadav, and Prasad (2016)
Foxtail millet	In diabetes, anti-hyperglycemic and anti-lipidemic agents and prevent pro-inflammatory and hypertrophic responses.	Hassan et al., 2021
Little millet	Reduce cholesterol level, reduce fasting blood glucose, blood glucose in diabetic	Hassan et al., 2021
Barnyard milletes	cancer-related inhibitor that lowers cholesterol and blood sugar levels	Sharma, Saxena, and Riar (2016),

4.3. Antidiabetic activity

Millets showed antidiabetic effects because they have ability to reduce the activity of digestive enzyme i.e. α-amylase and α-glucosidase (Ashwani et al., 2023). Several workers found anti-hyperlipidemic activity and decreased level of triglycerides of millets.

4.4. Antioxidant activity

Millet grains contain phenolics and flavonoids, which can act as antioxidants by chelating metal ions, acting as protective agents against cell damage caused by free radicals, preventing the formation of radicals, and enhancing the body's natural antioxidant system (Ashwani et al., 2023). Millet grains' phenolic content and antioxidant potential make them potential anti-aging agents also that shield cells from metabolic syndrome. Several studies showed antioxidant activity of phenolics and flavonoids of finger millet and confirmed the free radical scavenging potential of the phenolic content of seed coat. The antioxidant potential of seven millet varieties was examined by Chandrasekara and Shahidi (2011), who also confirmed that the phenolic extracts of millets demonstrated anticancer activity by scavenging peroxyl. Other factors studied included total phenolic content, total flavonoid content, ferrous ion chelating activity, and singlet oxygen scavenging capacity.

V. Conclusion

Since the beginning of time, millets have been utilised as a cereal and as a significant and distinctive source of a wide range of bioactive substances with a variety of health benefits. The nutritional value and potential medicinal applications of various millets have been the main topics of this review. As a readily available source of natural antioxidants, millet grains can shield the body from a range of oxidative stressors. Phenolics and flavonoids are the most common families of antioxidants, followed by various mineral sources and vitamins. Millets are most frequently used to treat hypoglycemic and hypolipidemic disorders. These millet grains were also widely used for their anti-inflammatory, antimicrobial, and antitumor properties. Over the past fifteen years, a substantial body of preclinical evidence has been gathered, nearly all of which points to successful outcomes for various test systems. The utilisation of millet grain residues as possible sources of fibre for food enrichment may make it possible to employ them in the creation of novel natural food ingredients. Utilization of millets as nutritional nourishment will be a excellent resources of food for developing countries.

References

[1]. Lee, S. H., Chung, I. M., Cha, Y. S., Park, Y. (2010). Millet consumption decreased serum concentration of triglyceride and C-reactive protein but not oxidative status in hyperlipidemic rats. Nutrition Research, 30(4), 290–296.

[2]. Gong, L., Cao, W., Chi, H., Wang, J., Zhang, H., Liu, J., Sun, B. (2018). Whole cereal grains and potential health effects: Involvement of the gut microbiota. Food Research International, 103, 84–102.

[3]. Sharma, S., Saxena, D. C., Riar, C. S. (2016). Anlysing the effect of germination on phenolics, dietary fibres, minerals and γ-amino butyric acid contents of barnyard millet (Echinochloa frumentaceae). Food Bioscience, 13, 60–68.

[4]. Muthamilarasan, M., Dhaka, A., Yadav, R., Prasad, M. (2016). Expolration of millet models for developing nutrient rich graminaceous crops. Plant Science, 242, 89–97.

[5]. Kim, Y. and Je, Y. (2016). Dietary fibre intake and mortality from cardiovascular disease and all cancers: A meta-analysis of prospective cohort studies. Archives of Cardiovascular Diseases, 109(1), 39–54.

[6]. Gowda, N.A.N., Siliveru, K., Prasad, P.V.V., Bhatt, Y., Netravati, B.P., Gurikar, C. (2022) Modern Processing of Indian Millets: A Perspective on Changes in Nutritional Properties. Foods. 9, 11(4):499.

[7]. Dinesh, C., Satish, C., Pallavi, A.K. S. (2016). Review of Finger millet (Eleusine coracana (L.) Gaertn): A power house of health benefiting nutrients, Food Science and Human Wellness. 5(3), 149-155.

[8]. Tripathi, G., Harsh, P., Jitendrakumar , Borah, Anchita, Das, Hiren, Bansal, Swarnika, Singh, Nikita, Singh, Bal, Nath, Dibyajyoti. (2023). A Review on Nutritional and Health Benefits of Millets. International Journal of Plant and Soil Science. 35. 1736-1743.

[9]. Laraib, Y., Dianzhi, H., Humna, L., Qun, S. (2021). Millet: A review of its nutritional and functional changes during processing, Food Research International, 142, 110197.

[10]. Hassan, Z.M., Sebola, N.A., Mabelebele, M. (2021). The nutritional use of millet grain for food and feed: a review. Agric Food Secur. 10(1), 16.

[11]. Shah, P., Kumar, A., Kumar, V., Tripathi, M.K. (2021). Millets, Phytochemicals, and Their Health Attributes. In: Kumar, A., Tripathi, M.K., Joshi, D., Kumar, V. (eds) Millets and Millet Technology. Springer, Singapore.

[12]. Ashwani, K, Pooja, K., Mukul, K. (2023). Chapter 23 - Role of millets in disease prevention and health promotion, Editor(s): Ram B. Singh, Shaw Watanabe, Adrian A. Isaza, Functional Foods and Nutraceuticals in Metabolic and Non-Communicable Diseases, Academic Press, Pages 341-357,