A Review on Nutritional and health benefits of Millets

Abstract :

Millets are esteemed for their healthy benefit incorporates nutrients, minerals, carbs, and dietary filaments source and potential medical advantages. Millets have gained attention in recent years due to their remarkable nutritional composition and potential health-promoting properties. This review examines the diverse types of millets, their historical significance, and their distribution across different cultures. The paper highlights millets' rich nutrient content, including proteins, dietary fibers, vitamins, and minerals, making them a valuable addition to a balanced diet. Furthermore, it explores the gluten-free nature of millets, catering to individuals with specific dietary requirements. The health benefits of millet consumption are discussed, focusing on their potential in preventing and managing chronic diseases like diabetes and cardiovascular disorders. The presence of bioactive compounds, such as antioxidants and polyphenols, is investigated for their role in supporting these health benefits. Additionally, the review discusses the impact of millets on gut health and their future prospects to global food security and sustainability. Overall, the findings underscore millet as a promising and nutritious option for enhancing human health.

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Keywords: Millets, Nutritional value, Health benefits of millets

Introduction :

Millets, a diverse group of small-seeded cereal grains, have garnered significant attention in recent years for their remarkable nutritional value and potential health benefits. The international year of Millets was celebrated in 2023 recognizing their importance by the government. As ancient crops with a long history of cultivation, millets have played a crucial role in providing sustenance to diverse cultures worldwide. Roti, produced using pearl millet has been the essential food of farmers in the state of Gujrat (FAO,2009). In the context of evolving dietary patterns and increasing health awareness, millets have emerged as a promising nutri-cereal crop with the potential to address various nutritional and health challenges.They can get through cruel climatic circumstances and are extremely tolerant to drought. (Shalley et al., 2022). They are significant dietary sources of energy (Samtiya et al., 2022). They can flourish without the utilization of pesticides since they are Resistant to various types of diseases prevailing in society (Thakur and Tiwari 2019).Some common types of millets include Pearl Millet (Pennisetum glaucum), known for its drought tolerance and rich source of iron and calcium; Finger Millet (Eleusine coracana), recognized for its high protein content and essential amino acids the nation .; Foxtail Millet (Setariaitalica), a gluten-free grain rich in fiber and minerals like iron and magnesium; Sorghum (Sorghum bicolor), often considered a millet, valued for its antioxidant properties and dietary fiber; and Proso Millet (Panicummiliaceum), a significant source of B-vitamins, iron, and calcium. These millet varieties offer diverse culinary applications and contribute to sustainable and nutritious diets worldwide. They are viewed as the Nutri-cereals of today and the coarse grains of yesterday due to the excellent quality of nutrients present in it. (Gowda et al., 2021). n order to address the dietary requirements of the world’s population, millets have seen a steady increase in production over the past few decades. All important constituents including protein, carbs, fat, minerals, vitamins, and bioactive substances, are abundant in millets, making them a great food source The tendency of millet fiber can lower harmful cholesterol

causing improvements in good cholesterol in humans (Hassan etal., 2021). Table 1 shows the Type, Common Name, botanical name, origin, uses, and disease ailments of millets.

Table 1: Type, Name, origin, uses, and disease ailments of millets

Type of Millet	Common Name	Botanical Name	Origin	Uses	Disease Ailments Addressed
Pearl Millet	Bajra	Pennisetum glaucum	Africa	Human consumption, livestock feed, biofuel	Anemia (rich in iron), digestive disorders
Finger Millet	Ragi	Eleusine coracana	East Africa	Staple food, porridge, baking	Diabetes (low glycemic index), malnutrition
Foxtail Millet	Kangni	Setariaitalica	East Asia	Human consumption, bird feed, brewing	Cardiovascular health (cholesterol-lowering)
Proso Millet	Barri	Panicummiliaceum	Eurasia	Human consumption, bird feed, alcoholic beverages	Gluten sensitivity, digestive disorders
Little Millet	Kutki	Panicumsumatrense	India	Human consumption, livestock feed	Diabetes (low glycemic index), obesity
Kodo Millet	Kodra	Paspalumscrobiculatum	India	Human consumption, bird feed	Diabetes (regulates blood sugar), obesity
Barnyard Millet	Sanwa	Echinochloafrumentacea	India	Human consumption, bird feed, livestock feed	Gluten sensitivity, diabetes, hypertension

Comment [A2]: When discussing technical topics, include your references so that the readers can determine whether they want an in-depth examination of the subject.

Comment [A3]: It is recommended to italicize or underline scientific names when writing them.

Comment [A4]: You need to clarify that millet is not a medication for a specific deficiency or health issue; rather, it just provides assistance.

Nutrient content of millets :

Millets indeed possess a rich nutrient content that contributes to their nutritional and health benefits. Millets are recognized for their relatively higher protein content compared to other major cereals. Table 2 explains protein, dietary fibre, vitamins, and minerals in different types of millet crops. For instance, finger millet (Eleusine coracana) contains about 7.7-12.3% protein, while foxtail millet (Setariaitalica) contains approximately 8-12% protein (Dida et al., 2008) (Dwivedi et al., 2012). Proso millet (Panicummiliaceum) has been reported to

contain 10-15% protein (Saleh et al., 2013). The protein content in millets makes them an essential source of plant-based protein in various diets. Millets are abundant in dietary fibers, which consist of both soluble and insoluble forms. The dietary fiber content in millets contributes to various health benefits, including improved digestive health and management of blood sugar levels. For example, barnyard millet (Echinochloafrumentacea) contains approximately 11-15% dietary fiber (Sharma et al., 2015). Similarly, finger millet (Eleusine coracana) is reported to have a dietary fiber content of about 3.6-5.8% (Habiyaremye et al., 2017). Millets are rich in various B-complex vitamins and other essential vitamins. For example, pearl millet (Pennisetum glaucum) is known for its high content of niacin (B3) and thiamine (B1) (Wang et al., 2011). Finger millet (Eleusine coracana) is a good source of riboflavin (B2), niacin (B3), pyridoxine (B6), and folate (B9) (Habiyaremye et al., 2017). Millets are rich in essential minerals like magnesium, phosphorus, manganese, and zinc. Finger millet (Eleusine coracana) has been reported to contain a higher concentration of calcium, iron, and zinc compared to other millets (Habiyaremye et al., 2017). Pearl millet (Pennisetum glaucum) is known to be a good source of iron and zinc (Wang et al., 2011).The principal capability of dietary starch is to supply energy. (Devi etal., 2011).Millets are also rich in antioxidants, which help combat oxidative stress and reduce the risk of chronic diseases. Foxtail millet (Setariaitalica) and proso millet (Panicummiliaceum) have been found to contain significant amounts of phenolic compounds and flavonoids, exhibiting strong antioxidant activity (Ganesan et al., 2018). Millets by and large contain critical measures of fundamental amino acids especially the sulfur-containing amino acids (methionine and cysteine); they are likewise higher in fat substance than maize, rice, and sorghum (Obilana and Manyasa,2002).

Table 2: Nutritional content in millets

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Millet Type	Protein (%)	Dietary Fiber (%)	Vitamins	Minerals
Pearl Millet	8-18	2-3	Thiamine (B1), Niacin (B3)	Magnesium, Phosphorus, Iron, Zinc
Finger Millet	7.7-12.3	3.6-5.8	Thiamine (B1), Riboflavin (B2), Niacin (B3), Pyridoxine (B6), Folate (B9)	Calcium, Iron, Phosphorus, Zinc
Foxtail Millet	8-12	5-8	Thiamine (B1), Niacin (B3), Folate (B9)	Magnesium, Phosphorus, Iron, Zinc
Proso Millet	10-15	1.2-12	Niacin (B3), Pyridoxine (B6), Folate (B9)	Magnesium, Phosphorus, Potassium, Zinc
Little Millet	7-12	6-9	Niacin (B3), Folate (B9)	Magnesium, Phosphorus, Iron, Zinc
Kodo Millet	8-11	8-9	Thiamine (B1), Niacin (B3), Folate (B9)	Magnesium, Phosphorus, Iron, Zinc
Barnyard Millet	6-11	11-15	Thiamine (B1), Niacin (B3), Folate (B9)	Magnesium, Phosphorus, Iron, Zinc

Millets likewise help in losing weight, diminishing the risk of colon disease, diminishes high BP, helps in easing back muscle degradation, helps in rest, helps in alleviating, menstrual cramps. Concentrates by Eunyoung Lee et al., 2023 recommend that millets seed oil enacts beta-catenin flagging and promotes hair development which is valuable for forestalling or treating androgen etic alopecia by advancing hair development.

Health benefits of millets :

Millets are coarse grains just similar to crops like wheat and rice grown subsequently in the Indian subcontinent. The grain is additionally wealthy in phytochemicals, including phytic corrosive, which is believed to bring down cholesterol, and phytate, which millets related with decreased disease risk (Coulibaly et al.,2011). have been recognized for their positive impact on gut health due to their high dietary fiber content and prebiotic properties. Dietary fiber in millets helps promote regular bowel movements, prevent constipation, and support overall digestive health (Saleh et al., 2013). The prebiotic effect of millet fibers nourishes beneficial gut bacteria, such as Bifidobacteria and Lactobacilli, leading to a balanced gut microbiome (Chethan et al., 2018). A diverse and balanced gut microbiome is associated with various health benefits, including improved immune function, reduced inflammation, and enhanced nutrient absorption.Millets are also rich in cancer preventing compounds including antioxidents (Amadou et al., 2011). Table 3 represents health benefits with the descriptions of millets.

Table 3: Health benefits of millets

Health benefits	Descriptions
Cardiovascular Health	Millets contain antioxidants, fiber, and certain phytochemicals that support heart health and may help reduce the risk of cardiovascular diseases (Ganesan et al., 2018). Millet consumption has been associated with improved lipid profiles, such as reduced LDL cholesterol levels (Gujral et al., 2013).
Diabetes Management	Millets have a lower glycemic index compared to other grains, which can help manage blood sugar levels and reduce the risk of type 2 diabetes (Shoba et al., 2021). The high fiber content in millets also contributes to better blood sugar control (Anilakumar et al., 2013).
Digestive Health	The dietary fiber in millets supports healthy digestion and may prevent constipation (Saleh et al., 2013). Millets have prebiotic effects, promoting the growth of beneficial gut bacteria and supporting overall gut health (Chethan et al., 2018).
Weight Management	The high fiber content in millets provides a feeling of fullness, helping in weight management and appetite control (Gujral et al., 2013). Millets are considered a good option for weight loss diets due to their nutrient density and lower caloric content (Shoba et al., 2020).
Gluten-Free Alternative	Millets are naturally gluten-free, making them suitable for individuals with celiac disease or gluten sensitivity (Bhullar et al., 2018). The inclusion of millets in gluten-free diets can add essential nutrients and variety to the menu (Gupta et al., 2021).

Antioxidant Properties	Millets are rich in antioxidants, such as phenolic compounds and flavonoids, which help neutralize free radicals and protect against oxidative stress (Ganesan et al., 2018). Antioxidants contribute to overall health and reduce the risk of chronic diseases (Chethan et al., 2018).
Nutrient-Rich Food Source	Millets are excellent sources of essential nutrients like proteins, vitamins, and minerals (Bhullar et al., 2018). Including millets in the diet can help meet nutrient requirements and promote overall health and well-being (Gujral et al., 2013).
Sustainable Agriculture	Millets are resilient to adverse environmental conditions, require less water, and have a lower carbon footprint compared to major cereals (Gupta et al., 2021). Cultivating millets supports sustainable agricultural practices and can contribute to food security (Shoba et al., 2020).

Millets offer a plethora of health benefits due to their rich nutrient content and low gluten content. They are excellent sources of fiber, aiding digestion, and promoting a feeling of fullness, thus supporting weight management. These grains have a low glycemic index, regulating blood sugar levels and reducing the risk of diabetes. Packed with essential minerals like iron, magnesium, and phosphorus, millets boost bone health and prevent anemia. They are gluten-free, making them suitable for celiac patients and aiding gut health. Additionally, millets are rich in antioxidants, helping combat free radicals and reducing the risk of chronic diseases. Incorporating millets into the diet promotes overall well-being.

Conclusion :

Millets are nutritional powerhouses that offer a wide array of health benefits. These ancient grains are a valuable source of essential nutrients, including fiber, minerals, and antioxidants, contributing to improved digestion, bone health, and disease prevention. Their low glycemic index makes them an ideal option for maintaining stable blood sugar levels and managing diabetes. Moreover, their gluten-free nature makes millets suitable for individuals with celiac disease and supports a healthy gut. Embracing millets as a regular part of our diet can lead to enhanced overall well-being and a healthier lifestyle. With their versatility and numerous health advantages, millets undoubtedly deserve a prominent place in our daily food choices.

Future prospects :

The future prospects of the nutritional and health benefits of millets appear promising due to increasing awareness of their nutritional value, sustainability, and potential to address global health challenges. Consumers are becoming more health-conscious and are seeking nutritious and sustainable food options. Millets, being rich in essential nutrients and gluten-free, align with these preferences, leading to an increased demand for millet-based products (Bhullar et al., 2018). Ongoing research on millets' nutritional composition and health benefits continues to unveil new insights. Studies on the bioactive compounds in millets, such as antioxidants and polyphenols, shed light on their potential role in disease prevention and health promotion (Chethan et al., 2018). Millets are known for their resilience to adverse environmental conditions, requiring less water and inputs compared to major cereal crops. Their cultivation supports sustainable agriculture and can contribute to climate change mitigation (Gupta et al., 2021). The nutritional composition of millets makes them suitable for addressing malnutrition and dietary deficiencies, especially in resource-constrained regions. Millets can play a vital

role in achieving food and nutrition security goals (Saleh et al., 2013). Increasing efforts in product development and innovation have led to a wide range of millet-based food products, catering to diverse consumer preferences. These products include millet-based snacks, cereals, beverages, and bakery items (Kumar et al., 2018).Many countries are recognizing the significance of millet in improving nutrition and promoting sustainable agriculture. Governments are implementing policies to promote millet cultivation, processing, and consumption (Shoba et al., 2020).The global millets market is witnessing growth, driven by increased exports, demand for gluten-free products, and the expansion of health-conscious consumer bases (MarketsandMarkets, 2021).

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