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Millets: An Ancient Grain with Modern Relevance in Global Nutrition and Agriculture

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INTRODUCTION

Millets are a group of small-seeded cereal crops that have long held significant importance in global agriculture and nutrition. These grains serve as a staple food for over one-third of the world's population, predominantly in Asia and Africa, where they are crucial sources of energy and nutrition. Globally, millets rank as the sixth most produced cereal crop, trailing behind maize, rice, wheat, barley, and sorghum (FAO, 2019). The primary types of millets include Sorghum (Jowar), Little Millet (Sama), Finger Millet (Ragi), Foxtail Millet (Korra), and Proso Millet (Variga), each with distinctive nutritional profiles.

For example, Bajra (Pearl Millet) and Little Millet are characterized by their higher fat content, which contributes to their energy density. In contrast, Finger Millet is notable for its low-fat content and exceptionally high calcium levels, among the highest of all cereals. These grains have been integral to human diets for millennia; archaeological evidence traces millet cultivation back to 3000-2000 BCE in regions such as China and India, highlighting their enduring role in traditional agriculture and food systems (Saleh *et al*., 2013).

Historically, millets were more commonly consumed than wheat in Europe during the Middle Ages. For instance, the Romans and Gauls prepared porridges from millets, valuing them as more accessible and nutritious compared to wheat-based foods. In the contemporary era, the majority of the world's commercial millet production is concentrated in countries like China, India, Nigeria, and Niger, with India emerging as a leading producer (ICRISAT, 2012). Despite their global importance, millets are often underutilized in developed nations, where they are primarily used as animal feed rather than for human consumption.

Millets boast a superior nutritional profile compared to more commonly consumed cereals like rice and wheat. They are rich in dietary fiber, proteins, vitamins, and minerals, and exhibit a low glycemic index, which makes them suitable for individuals with diabetes and those aiming to manage their weight. Compared to rice and wheat, millets contain three to five times higher levels of essential nutrients such as iron, calcium, and phosphorus. This nutrient density positions millets as a critical component in achieving food and nutritional security, especially in regions vulnerable to food scarcity and malnutrition (Kaur *et al*., 2014).

Additionally, millets are renowned for their resilience in adverse climatic conditions. They require less water and can thrive in poor soil conditions, making them an ideal crop for arid and semi-arid regions. This resilience not only bolsters food security but also supports livelihoods by providing farmers with a dependable crop under shifting climatic conditions (Muthamilarasan and Prasad, 2021).

In India, Karnataka stands out as the leading producer of millets, where they are cultivated extensively and form a fundamental part of the local diet. However, despite their myriad benefits, there is a notable lack of awareness regarding the health advantages and nutritional value of millets among the broader Indian population. India contributes over 58% of global millet production, yet their consumption remains limited due to insufficient knowledge and promotion. Enhancing the visibility and incorporation of millets in diets could significantly address lifestyle-related health issues such as diabetes, cardiovascular diseases, and obesity (Singh and Raghuvanshi, 2012).

Millets

Millets are traditionally cultivated with minimal or no use of pesticides, growing in environments that naturally deter pests. For instance, foxtail millet is known to resist pests and, when stored with pulses like green gram, acts as a natural deterrent, reducing the need for chemical fumigants. Despite their relatively modest role in Indian agriculture compared to other feed crops, millets are vital for ensuring regional and farm-level food security due to their resilience and ability to thrive under harsh conditions, including (Reddy *et al*., 2019).

Millets offer superior nutrition compared to staple grains like rice and wheat. For example, finger millet is exceptionally high in calcium, with levels about 30 times greater than those found in rice. Additionally, foxtail and little millet provide significantly higher iron content compared to rice. The high concentration of essential micronutrients, including vitamins and beta-carotene, makes millets a valuable component in combating malnutrition and obesity. Millets have also been shown to be beneficial for managing chronic conditions such as diabetes and cardiovascular diseases due to their low glycemic index and high fiber content (Reddy *et al*., 2019).

Nutritional profile of millets

Millets contain approximately 65% carbohydrates, 9% protein, 3% fat, and 2-7% crude fiber, along with an array of vitamins and minerals. They are particularly rich in B vitamins, magnesium, antioxidants, manganese, phosphorus, and iron. Despite their lack of lysine and threonine, millets are high in sulfur-containing amino acids like methionine and cysteine. Millet oil is rich in linoleic acid and tocopherols, providing essential fatty acids beneficial for health (Chandrasekara and Shahidi, 2010).

Types of millets and their benefits

- **Sorghum:** Sorghum is a traditional grain in India and Africa, valued for its gluten-free nature, making it suitable for individuals with celiac disease or gluten sensitivity. It is rich in calcium, iron, protein, and fiber, and has been associated with reduced cholesterol levels due to the presence of sorghum wax.
- **Finger Millet:** This millet is noted for its high calcium content, supporting bone health and reducing fracture risk. Its iron content is beneficial for anemia treatment, and its fiber aids in digestion and prevents constipation.
- **Pearl Millet:** Pearl millet is recognized for its magnesium content, which helps in

alleviating respiratory issues in asthma patients and reducing migraine risk. Its high fiber content lowers the risk of gallstone formation.

- **Kodo Millet:** Kodo millet is rich in phytochemicals and antioxidants, which are effective in preventing lifestyle-related diseases and alleviating joint pain. It also helps regulate menstruation in women.
- **Proso Millet:** Proso millet's high niacin content helps prevent pellagra, a disease caused by niacin deficiency. It is traditionally used as a recuperative food, particularly beneficial post-pregnancy or illness.
- **Foxtail Millet:** Known for its steady glucose release, foxtail millet is beneficial for diabetes management. Its magnesium content supports heart health.
- **Little Millet:** Despite its small size, little millet is rich in B-vitamins, calcium, iron, zinc, and potassium. Its high fiber content aids in weight loss and it can be used as a rice substitute in various dishes like pongal or kheer (Kole *et al*., 2017).

Health Benefits of Millets

- **Obesity Management:** The high dietary fiber content in millets (22%) is significantly greater than that in wheat (12.6%) and rice (4.6%), aiding in weight management by improving digestion and reducing chronic disease risks.
- **Diabetes Control:** Millets help control postprandial hyperglycemia by inhibiting enzymes such as α-glucosidase and pancreatic amylase. They also aid in preventing diabetic complications due to their antioxidant properties.
- **Cardiovascular Health:** Regular consumption of millets can elevate HDL cholesterol levels and reduce plasma triglycerides, lowering cardiovascular disease risk. Millets magnesium content also helps in reducing blood pressure and preventing heart attacks.
- **Cancer Prevention:** Phenolic acids, phytates, and tannins in millets exhibit anticancer properties by reducing the risk of colon and breast cancer. Additionally, the antioxidants in millets aid in detoxification, further lowering cancer risks.
- **Celiac Disease:** Millets are gluten-free, making them suitable for individuals with celiac disease, thereby reducing gluten-induced irritation.
- **Phytochemicals and Antioxidants**: Millets are rich in phytochemicals like polyphenols, which act as antioxidants and boost the immune system. These compounds neutralize free radicals, reducing the risk of various chronic diseases (Chandrasekara and Shahidi, 2010).

CONCLUSION

Modern diets low in fiber and high in refined foods are fueling problems like diabetes, obesity, and heart disease. Swapping polished rice, refined wheat products, and packaged foods with millet-based meals can meaningfully improve day-to-day health. Millets are packed with fiber, protein, calcium, and iron, which help manage blood sugar and weight, support children's growth, strengthen bones, and reduce anemia. They are naturally gluten-free, making them a safe choice for people with celiac disease or gluten intolerance. Their phytosterols, policosanols, and antioxidants also support heart health and protect the body from oxidative damage. Although millets have been valued for centuries, they are still not a regular part of many modern diets. Bringing millets back to the plate can help fight malnutrition and lifestyle diseases while improving overall well-being.

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