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Millets: An Ancient Grain for Modern Health and Sustainability

Rajesh [a]*, Mumtaz Ahmad [b], Nasim Ahmad [c]

[a] *Research Officer (U), Scientist-3, Regional Research Institute of Unani Medicine, Patna, Bihar*
[b] *Deputy Director, Regional Research Institute of Unani Medicine, Patna, Bihar*
[c] *Technical Officer (U), Regional Research Centre (Unani), Prayagraj, Uttar Pradesh*
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A B S T R A C T

Millets, a group of small-seeded grasses, have gained significant attention in recent years due to their exceptional nutritional value, resilience to adverse growing conditions, and potential for sustainable agriculture. This review explores the diverse nutritional composition and health benefits of millets, highlighting their role in addressing malnutrition and promoting food security, particularly in regions vulnerable to climate change.

Millets are rich sources of dietary fiber, vitamins, minerals, and essential amino acids, offering a wide array of health benefits, including improved digestion, weight management, and a reduced risk of chronic diseases such as diabetes and cardiovascular ailments. Moreover, their gluten-free nature and low glycemic index make them suitable for individuals with specific dietary requirements, contributing to their growing popularity in the global market.

The adaptability of millets to diverse agro-climatic conditions, their low water requirements, and minimal input dependency underscore their potential as sustainable crops for enhancing agricultural resilience and mitigating environmental degradation. However, challenges such as limited awareness, inadequate infrastructure, and insufficient policy support hinder their widespread adoption and utilization. Addressing these challenges requires concerted efforts from policymakers, researchers, and stakeholders to promote millet cultivation, processing, and consumption through targeted interventions, market incentives, and awareness campaigns.

Harnessing the nutritional and environmental benefits of millets offers promising opportunities for advancing food security, nutrition, and sustainable agriculture, thereby contributing to the achievement of global development goals.

The Unani system of medicine considers fiber-rich foods essential for maintaining a healthy bodily balance and preventing various health issues, further reinforcing the significance of millets in both traditional and modern dietary practices.

KEYWORDS: Millets, Unani Medicine, Glycemic index, Dietary fiber

1. INTRODUCTION

In the realm of sustainable agriculture and nutrition, millets emerge as silent heroes, quietly nourishing populations across the globe for millennia. These humble grains, often overshadowed by more prominent staples like wheat and rice, hold within them a wealth of nutritional prowess and environmental resilience.

Originating from ancient farming practices in Asia and Africa, millets have sustained generations with their robust nutritional profiles and adaptability to diverse climates and soil conditions. From the vast arid landscapes of the Sahel region to the terraced hillsides of Asia, millets have been the cornerstone of diets, providing sustenance and vitality to communities for centuries.

As the world grapples with the challenges of climate change, dwindling natural resources, and food insecurity, the resurgence of interest in millets offers a glimmer of hope and possibility. These small, yet mighty grains possess the power to transform agricultural landscapes, promote biodiversity, and nourish populations sustainably.

In Unani medicine, fiber-rich foods are essential. These foods help improve the digestive system and are beneficial for controlling conditions like constipation, obesity, and high cholesterol. A balanced, fiber-rich diet is recommended to maintain digestive regularity and overall health. Fiber-rich foods in Unani therapy are considered key to maintaining a healthy balance within the body and preventing many health problems.

Millets have a long history in Unani medicine, and there is rich literature surrounding their use in this traditional system. Millets are considered highly nutritious, containing fiber, vitamins, and minerals that promote better health. They are recommended for improving digestion, balancing blood sugar

levels, and boosting overall immunity. Unani practitioners have long recognized the health benefits of these grains, which is why millets hold a significant place in the dietary recommendations.

2. VERNACULAR NAME

2.1 **Pearl Mille**t: Bajra (Hindi), Sajje (Kannada), Kambu (Tamil), Bajri (Gujarati), Sajja (Telugu)

2.2 **Finger Millet**: Ragi (Hindi, Kannada, Tamil, Telugu), Nachni (Marathi), Mandia (Odia), Kezhvaragu (Tamil)

2.3 **Foxtail Millet**: Kangni (Hindi), Navane (Kannada), Thinai (Tamil), Kang (Gujarati), Korra (Telugu)

2.4 **Proso Millet**: Cheena (Hindi), Baragu (Kannada), Varagu (Tamil), Cheno (Gujarati), Barri (Telugu)

2.5 **Little Millet**: Kutki (Hindi), Same (Kannada), Samai (Tamil), Kutki (Gujarati), Samalu (Telugu)

2.6 **Kodo Millet**: Kodra (Hindi), Harka (Kannada), Varagu (Tamil), Kodri (Gujarati), Arikelu (Telugu)

3. TYPES

3.1 **Pearl Millet (Pennisetum glaucum)**: Pearl millet, also known as bajra in India, is one of the most widely cultivated types of millets. It is a staple food in many parts of Africa and Asia. Its grains are larger compared to other millet varieties and have a mild, nutty flavor. They are used to make flatbreads, porridges, and fermented beverages.

3.2 **Finger Millet (Eleusine coracana):** Finger millet, known as ragi in India, is a highly nutritious millet variety rich in calcium, iron, and dietary fiber. It is commonly used in South Indian cuisine to make dishes such as dosa, idli, and porridge. Ragi flour is also used in baking and as a thickening agent in soups and gravies.

3.3 **Foxtail Millet (Setaria italica):** Foxtail millet is another popular millet variety cultivated in Asia. It has small, yellowish grains and a mild, slightly sweet flavor. This millet is versatile and can be used in various dishes, including porridges, upma (a savory breakfast dish), pilafs, and desserts.

3.4 **Proso Millet (Panicum miliaceum):** Proso millet, also known as broomcorn millet or white millet, is cultivated primarily in Eastern Europe, Russia, and parts of Asia. It has a creamy white color and a mild, slightly sweet flavor. Proso millet is used in porridges, pilafs, baked goods, and as birdseed.

3.5 **Little Millet (Panicum sumatrense):** Little millet is a small-grained millet variety cultivated in India and parts of Southeast Asia. It is known for its high nutritional value and drought tolerance. Little millet grains are tiny and round, resembling mustard seeds. They are used in porridges, upma, idli, and dosa batter, and can also be popped like popcorn as a snack.

3.6 **Kodo Millet (Paspalum scrobiculatum):** Kodo millet is another nutrient-rich millet variety commonly grown in India and Nepal. It is known for its resilience to adverse environmental conditions. Its grains are small and elongated with a reddish-brown color. They are used in porridges, khichdi (a mixed rice and lentil dish), and traditional alcoholic beverages.

4. CHEMICAL CONSTITUTES:

Millets contain a variety of chemical constituents that contribute to their nutritional value and health benefits. Micronutrients are essential vitamins and minerals that are required by the body in small quantities but play crucial roles in various physiological functions, including metabolism, immune function, and overall health. Millets are rich sources of several micronutrients, making them valuable components of a nutrient-dense diet. Here's an overview of the micronutrients found in millets:

4.1 Carbohydrates:

Millets are rich in carbohydrates, serving as an excellent source of energy. The carbohydrate content in millets generally ranges from 60% to 75% of the dry weight.

The carbohydrates in millets primarily consist of complex carbohydrates, including starch and dietary fiber. This complex carbohydrate profile contributes to sustained energy release and helps regulate blood sugar levels.

4.2 Proteins:

Millets are notable for their relatively high protein content compared to other grains. The protein content in millets typically ranges from 8% to 18% of the dry weight.

The proteins in millets are considered to be of good quality, containing a balanced profile of essential amino acids. Millets are particularly rich in lysine, an essential amino acid that is often limited in other cereal grains like maize and rice.

4.3 Fats:

Millets are relatively low in fat compared to oilseeds and nuts, with fat content typically ranging from 2% to 7% of the dry weight.

However, the fats in millets are predominantly healthy unsaturated fats, including monounsaturated and polyunsaturated fats. These fats contribute to heart health and provide essential fatty acids necessary for various physiological functions in the body.

Dietary Fiber:

Millets are rich sources of dietary fiber, which includes both soluble and insoluble fibers. The fiber content in millets varies among different types but generally ranges from 3% to 12% of the dry weight.

Dietary fiber plays a crucial role in digestive health, promoting regular bowel movements, preventing constipation, and supporting gut microbiota diversity.

Vitamins:

Millets contain a range of vitamins, including:

- Vitamin B-complex: Millets are particularly rich in B-vitamins such as thiamine (B1), riboflavin (B2), niacin (B3), pyridoxine (B6), folate (B9), and pantothenic acid (B5). These vitamins play essential roles in energy metabolism, nervous system function, and red blood cell production.
- Vitamin E: Millets are a good source of vitamin E, an antioxidant vitamin that protects cells from oxidative damage and supports immune function.
- Vitamin K: Millets contain vitamin K, which is important for blood clotting and bone health.

Minerals:

Millets are rich sources of various minerals, including:

- Iron: Millets contain significant amounts of iron, an essential mineral involved in oxygen transport, energy metabolism, and immune function. Iron deficiency is a common nutritional concern worldwide, and millets can help meet dietary iron requirements.
- Magnesium: Millets are excellent sources of magnesium, a mineral that is involved in hundreds of biochemical reactions in the body, including energy production, muscle function, and bone health.
- Phosphorus: Millets provide phosphorus, a mineral important for bone health, DNA synthesis, and energy metabolism.
- Potassium: Millets contain potassium, which plays a critical role in fluid balance, muscle function, and blood pressure regulation.
- Zinc: Millets contain zinc, an essential mineral that supports immune function, wound healing, and cell growth and repair.
- Calcium: While millets are not as rich in calcium as dairy products, they still provide some calcium, which is essential for bone health and muscle function.

Antioxidants and Phytochemicals:

Millets contain various antioxidants and phytochemicals, including phenolic compounds, flavonoids, and carotenoids, which have antioxidant and anti-inflammatory properties. These bioactive compounds help protect cells from oxidative damage, reduce inflammation, and support overall health.

- **Phytochemicals**: Millets contain various phytochemicals, including phenolic compounds, flavonoids, and antioxidants. These phytochemicals have anti-inflammatory, antioxidant, and anticancer properties, which may help protect against chronic diseases such as cancer, heart disease, and diabetes. Finger millet (ragi) is particularly rich in phytochemicals, making it a potent functional food with potential health benefits.

Millets have been studied for their potential cardiovascular health benefits, including their cholesterol-lowering effects. High levels of cholesterol, particularly low-density lipoprotein (LDL) cholesterol, are a risk factor for cardiovascular diseases such as heart disease and stroke. Here's how millets may contribute to improving cholesterol levels and promoting cardiovascular health:

1. **Soluble Fiber Content**:
    - Millets, especially whole grains, are rich in soluble fiber, which has been shown to help lower LDL cholesterol levels.
    - Soluble fiber binds to cholesterol in the digestive tract, preventing its absorption into the bloodstream and promoting its excretion from the body.

2. **Beta-Glucans**:
    - Certain types of millets, such as barley and oats, contain beta-glucans, a type of soluble fiber known for its cholesterol-lowering effects.
    - Beta-glucans form a gel-like substance in the digestive tract, which traps cholesterol and bile acids, leading to their excretion from the body.
3. **Phytosterols**:
    - Millets contain phytosterols, plant compounds that have a similar structure to cholesterol and compete with cholesterol for absorption in the gut.
    - Phytosterols help reduce LDL cholesterol levels by inhibiting cholesterol absorption, thereby lowering blood cholesterol levels.
4. **Antioxidant Compounds**:
    - Millets contain antioxidant compounds, including phenolic compounds and flavonoids, which have been shown to have cardioprotective effects.
    - Antioxidants help prevent the oxidation of LDL cholesterol, which is a crucial step in the development of atherosclerosis (hardening of the arteries).
5. **Low Glycemic Index (GI)**:
    - Millets have a relatively low glycemic index, which means they cause a gradual and steady increase in blood sugar levels after consumption.
    - Low-GI foods may help improve insulin sensitivity and reduce the risk of cardiovascular diseases, including heart disease and stroke.

5. MEDICINAL USES:

Millets have been traditionally used for various medicinal purposes due to their nutritional richness and health-promoting properties. Here are some of the medicinal uses of millets:

5.1 Digestive Health: Millets are rich in dietary fiber, which promotes digestive health by preventing constipation, regulating bowel movements, and supporting the growth of beneficial gut bacteria. Consuming millets regularly can help alleviate digestive issues such as bloating, gas, and indigestion.

5.2 Weight Management: Millets are low in calories and fat while being high in fiber and protein, making them an ideal food for weight management. The fiber content in millets helps promote satiety, reducing hunger cravings and preventing overeating. Including millets in the diet can aid in weight loss or weight maintenance efforts.

5.3 Diabetes Management: Millets have a low glycemic index (GI), meaning they cause a slower and steadier increase in blood sugar levels compared to high-GI foods like white rice and wheat. Consuming millets can help regulate blood sugar levels, making them suitable for individuals with diabetes or those aiming to manage their blood sugar levels.

5.4 Heart Health: The high fiber and magnesium content in millets can help lower cholesterol levels and reduce the risk of cardiovascular diseases such as heart attacks and strokes. Millets also contain antioxidants and phytochemicals that have anti-inflammatory properties, which can help protect against heart disease.

5.5 Bone Health: Certain millets, such as finger millet (ragi), are rich in calcium, which is essential for bone health and preventing osteoporosis. Regular consumption of millets can help strengthen bones, especially in individuals at risk of calcium deficiency or bone-related disorders.

5.6 Anemia Prevention: Millets, particularly finger millet (ragi), are rich in iron and other minerals essential for red blood cell production. Including millets in the diet can help prevent iron deficiency anemia and improve overall blood health.

5.7 Antioxidant Properties: Millets contain antioxidants such as phenolic compounds and flavonoids, which help neutralize harmful free radicals in the body and reduce oxidative stress. Antioxidants play a crucial role in preventing chronic diseases and promoting overall health and longevity.

5.8 Immune Support: The vitamins and minerals present in millets, including vitamin C, vitamin E, zinc, and selenium, support immune function and help strengthen the body's defense against infections and diseases. Consuming millets regularly can help boost immunity and promote overall wellbeing.

6. CONCLUSSION:

In conclusion, millets emerge as versatile and valuable crops with multifaceted significance across nutrition, agriculture, culture, and sustainability. With their rich nutritional profile, including balanced macronutrients, dietary fiber, vitamins, and minerals, millets offer a potent solution to combat malnutrition and diet-related health issues. Moreover, their ability to thrive in diverse agro-climatic conditions makes them essential for enhancing agricultural resilience, promoting food security, and mitigating the impacts of climate change on farming communities.

Culturally, millets hold deep-rooted importance, serving as staples in traditional diets, culinary practices, and rituals across various societies. Preserving this cultural heritage while promoting the consumption and production of millets in modern food systems becomes imperative for holistic development.

In addressing global challenges such as poverty alleviation and climate change, millets emerge as climate-smart crops that offer sustainable solutions. By supporting smallholder farmers, enhancing market opportunities, and fostering research and innovation in millet cultivation and utilization, stakeholders can unlock the full potential of millets to promote inclusive growth, resilience, and sustainability.

In summary, the discourse surrounding millets underscores their critical role in shaping a healthier, more resilient, and sustainable future for communities worldwide. Through collaborative efforts and strategic interventions, millets can emerge as catalysts for positive change, contributing to improved nutrition, livelihoods, and environmental stewardship on a global scale.

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