REVIEW ARTICLE

Millets: Need of the Hour – An Overview

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ABSTRACT

This comprehensive article investigates millet's role in supporting sustainable agriculture and mitigating global health issues, especially malnutrition. A varied family of small-seeded grains, millets are very essential source of nutrients and plays very crucial role in a gluten-free, high-nutrient substitute for traditional cereals. The article examines India's initiatives to grow and promote millets, highlighting the crop's critical role in preventing malnutrition, addressing lifestyle-related health problems, and fostering food security. India is a significant millet producer. The United Nations proclamation of the International Year of Millets highlights 2023, the significance of millets recognised worldwide. India's state-specific programmes and legislative actions show a concerted attempt to promote millet as a staple grain in line with global health and development objectives.

KEYWORDS

Millets, Malnutrition, Undernutrition, Micronutrients

INTRODUCTION

Millets, commonly referred to as nutri-cereals, are a category of small-seeded grasses well-suited for thriving in tropical and subtropical climates, even with minimal requirements for fertilizers and water. These are the first crop plants to be domesticated by humans. The short growing period is one of the unique characteristics of millets.(1) India is renowned for its extensive variety of traditional millet crops, each differing in quality and crop duration. The major millets cultivated include sorghum (also known as great millet or jowar), pearl millet (bajra), and finger millet (ragi). In addition to these, a range of minor millets are grown such as foxtail millet (korra), proso millet (cheena), kodo millet, barnyard millet (sawa), and little millet (kutki). Furthermore, two crops often classified as pseudo-millets- buckwheat (kuttu) and amaranth (chaulai)-are also part of India's diverse millet portfolio. Millets have high nutritional content and are rich in dietary fiber, vitamins, proteins, and minerals.(2,3)

The main cereals that are consumed worldwide include maize, wheat, rice, rye, oats, barley millets.(1) A diverse group of forage grasses characterized by their small grains is collectively known as "millets".(2) Millets are members of the Poaceae (Gramineae) family of grains and are also known as small-seeded grains. They are mostly recognized for their edible seeds, starchy and are thought to be minor cereals.(1)

Only a small percentage of the world's millets come from developed nations; the majority are grown and consumed in developing nations (Meena et al. 2021). With a combined millet production of roughly 29 lakh tons, Africa and Asia led the world's millet production. The European Union came in second with a total production of roughly 591691.55 T.(3)

In India out of all food grains, 10% food grains are millet. India produces and consumes a wide variety of millets due to the country's diverse geography, climate, and culture. Millets require fewer resources to cultivate, and they can be planted without fertilizer in arid soil. Table 1 lists the

common millets grown in India. The most extensively researched millet is sorghum, and the Indian Institute of Millet Research (IIMR) in Hyderabad is a leading research organization.(3)

Millets are members of the Gramineae family of grasses, and there are at least fourteen species and ten genera in this family. The most significant millets among them are

- foxtail millet/ kangni (Setaria italica),
- proso millet/ chena or barri (Panicum miliaceum),
- finger millet/ ragi (Eleusine coracana), and
- pearl millet/ bajra (Pennisetum glaucum).

The other minor millets are from the Paniceae tribe, such as

- fonio/ acha or findi or hungry rice (Digitaria exilis),
- kodomillet/ kodo or kodra (Paspalum scrobiculatum), and
- tef (Eragrostis tef)

While some varieties of foxtail and proso millet contain gluten, millets are generally known for providing highly nutritious, gluten-free, and acid-forming diets.(2) Among the first foods that humans ate were millets, which are tiny, seeded turfs that grow in four seasons and are commonly sown as grain crops and hence also known as versatile crops.(1,2)

Why millets are needed?

Millets having huge historical significance, still there is reduction in the consumption and cultivation of millets in India can be attributed to several factors. After the Green Revolution, the government encouraged the development of high yield rice and wheat varieties and their large-scale production through implementation of various schemes, subsidies, and guaranteed procurement prices, which led to a shift from traditional crops like millets. Consequently, the area under millet production in India decreased by two-thirds (33.9%) from 1951 to 2022. People in various socioeconomic groups predominantly favour rice and wheat as their primary staples over millets, often perceiving millets as a less preferred or stigmatized choice considering it as “Poor Man's Food.”(4) On the other hand, urbanization, modern lifestyles, lack of awareness, and decline in traditional farming practices are the additional reasons for the decreased millet production.

Despite numerous preventive measures aimed at ensuring proper nutrition and diet, the human, particularly children-continues to suffer from severe malnourishment. Malnutrition is detrimental to human development. The two main effects of malnutrition which affects 161 million and 99 million children worldwide, respectively are stunting and underweight. One-third of these stunted and underweight children survive in Africa, while half of these children live in Asia. Malnutrition accounts for nearly half of the under-five children death, and a recent study on stunting indicates that India has the highest rate of child malnutrition worldwide. (4,5)

India is a millet hub:

India shares approximately 36.08% of the total production of millets worldwide which is the highest among all. State contribution in that is shown in table number 1(6):

Table 1: State-wise production of millets and their share in percentages

States	Production (In ' 000 Tonne)	Share in Total Production (%)	Area (In ' 000 Hectare)
Madhya Pradesh	74	0.1996	84
Himachal Pradesh	4.64	0.0125	5.21
Uttarakhand	70.97	0.1914	53
West Bengal	5.54	0.0149	6.1
Karnataka	37.49	0.1011	49
Tamil Nadu	37.34	0.1007	25.85
Arunachal Pradesh	27.43	0.074	26.76
Andhra Pradesh	22	0.0593	22
Maharashtra	21.97	0.0592	40.98
Nagaland	9.98	0.0269	8.83
Chhattisgarh	19.04	0.0513	63.37
Rajasthan	5.24	0.0141	10.12
Odisha	16.99	0.0458	32.87
Uttar Pradesh	5.82	0.0157	8

Health benefits:

Millets are rich in micronutrients, dietary fiber, good quality fat, proteins, carbohydrates, Vitamin B, and phytochemicals like inulin, sterols, and phenolic compounds (e.g., syringic acid, ferulic acid, quercetin, etc.). Millet phyto compounds are mostly free radical scavengers possessing antioxidant, antimicrobial, anti-diabetic, anti-

inflammatory, neuro, and cardioprotective properties.(5) Minor millets like Barnyard, Kodo, and foxtail have a high proportion of dietary fiber with a low glycemic index, which helps in controlling weight, cholesterol, blood sugar, and cataracts in diabetic patients. Kodo millet is rich in iron and an excellent immune booster. Phytic acids, magnesium, and potassium in millets contribute to their role in controlling CVDs by regulating blood pressure and plasma triglycerides.(7)

An ancient proverb states, "A bird that eats rice is frictionless; a tiger that eats Jowar is strong; a nirogi that eats Ragi remains nirogi"-wisdom particularly relevant in contemporary times. Since gaining independence, India has experienced remarkable growth, with universal healthcare being a fundamental goal since the Constitution's inception. However, India now faces a complex malnutrition crisis encompassing both under-nutrition (deficiencies in vitamins, minerals, and proteins) and over-nutrition (obesity, metabolic syndrome, and lifestyle diseases). This situation underscores the urgent need to transition toward healthier, more economical, and readily available dietary options that incorporate millets.(8)

Millet contains an abundant amount of alpha-tocopherol, thiamine, riboflavin, niacin, and folic acid, along with the minerals calcium (Ca), phosphorus (P), magnesium (Mg), potassium (K), iron (Fe), and manganese (Mn). Millets offer number of health advantages which includes reduced risk of diabetes, obesity, cancer, gastrointestinal tract (GI) problems, and cardiovascular diseases (CVDs). Furthermore, because millets are gluten-free, they might be the greatest option for those who have celiac disease.(9)

According to WHO estimates, 347 million people worldwide will develop diabetes, with type 2 diabetes making up about 90% of all cases of the disease. Current reports in children showing the prevalence of type 2 diabetes and the WHO's prediction that diabetes-related deaths would double by 2030 necessitate an urgent need for low-GI and nutritious foods. Important efforts should be made to increase and enrich the nutrient content of current staple crops and to introduce wholesome, low-GI foods. Therefore, millets are essential because we need other food crops that can sufficiently meet our nutritional needs and have a lower GI to prevent diabetes.(1)

The contemporary sedentary lifestyle, linked to numerous health issues, has compelled individuals to adopt wholesome and nourishing food habits. With this in mind, millets make excellent substitutes for other foods when it comes to nutrition and leading a healthy lifestyle. Millets are a veritable nutritional gold mine. The use of millet abruptly declined following the Green Revolution because the uprising's primary focus was on securing food security rather than addressing food insecurity. Neglecting millet has the disadvantage of causing numerous health problems across the globe. Now days, millet-based foods and beverages are most popular to consumed in a large number of regions across numerous nations. They are referred to as alcoholic and non-alcoholic beverages, flour-based foods, and whole-grain foods.(8)

Table 2 Health Benefits of Millets can be summarized as follows (10):

Health Benefits of Millets	Description
1. Rich in Nutrients	Contains essential minerals, vitamins, and antioxidants.
2. Gluten-Free	Suitable for individuals with gluten sensitivity and celiac disease.
3. Low Glycemic Index	Helps manage blood sugar levels, beneficial for diabetes management.
4. High in Fiber	Aids digestion, promotes regular bowel movements, and helps control hunger.
5. Heart Health	Lowers blood pressure, reduces cholesterol levels, and maintains cardiovascular function.
6. Weight Management	High fiber content supports weight loss and helps maintain a feeling of fullness.
7. Bone Health	Contains phosphorus and magnesium, essential for bone health.
8. Antioxidant Properties	Neutralizes free radicals, reducing oxidative stress.
9. Reduced Risk of Chronic Diseases	Lowers the risk of cardiovascular diseases, diabetes, and certain cancers.
10. Improved Digestive Health	Promotes overall digestive health due to high fiber content.

2023 as an International Year of Millets and Current Situation in India and its State -

To promote nutritional benefits of millets as well as their appropriateness for growing in harsh and changing climatic circumstances, the United Nations General Assembly has declared 2023 to be the International Year of Millets. To give people wholesome food and lessen dependency on imported cereals, the Indian government proposed declaring 2023 “the International Year of Millets”.

Together, the Secretariat and the Steering Committee oversee all of the International Year of Millets (2023) programmes and events. Participation in the International Year of Millets in 2023 is open to any government, city, business firm, NGO, journalist, civil society group, or individual. The IYM 2023 supports the goals of the UN 2030 Agenda for Sustainable Development, especially those related to life on land, responsible consumption and production, decent work and economic growth, good health and well-being, zero hunger, and climate action.(11)

Over the years, the Indian government has implemented a number of millets-related policy initiatives. Some of the major policy initiatives the Indian government has made in relation to millets, per a report by NITI Aayog, include

- 2012: Initiative for Nutritional Security through Intensive Millet Promotion (INSIMP)
- 2013: National Food Security Act (NFSA)
- 2014: National Mission on Sustainable Agriculture (NMSA)
- 2014: Rainfed Area Development Programme (RADP)
- 2018: Declaration of the year 2018 as the National Year of Millets
- 2018: Launch of the Millet Mission under the National Food Security Mission (NFSM)
- 2023: Declaration of the year 2023 as the International Year of Millets by the United Nations, at the behest of the Government of India

During India's G20 presidency, the Ministry of Agriculture and Farmers Welfare of the Government of India promoted millet and featured it at a number of events, including the International Trade Fair and Surajkund Mela.(11)

In 2016, the Andhra Pradesh State Government initiated a programme titled Comprehensive Revival of Tribals' Millets Cultivation in North Coastal Andhra and Certain Areas of Rayalaseema. The goal of this comprehensive programme on Andhra Pradesh's millets revival is to turn rain-fed and tribal areas into millet hubs, which have the capacity to provide millets, spur demand, and establish a position for themselves in the grain economy.(12)

The Andhra Pradesh Drought Mitigation Project (APDMP), an IFAD and GoAP-funded initiative, is a concentrated and coordinated attempt to boost incomes, strengthen the resilience of 95,000 farm households to drought, and address the general issue of recurring drought. The project aims to enhance agricultural productivity and resilience in 315 drought-prone gram panchayats, located across 105 clusters or blocks in the southern Andhra Pradesh districts of Ananthapuramu, Kadapa, Kurnool (Rayalaseema region), Chittoor, and Prakasam."(12)

In an effort to establish Chhattisgarh as the millet hub of India, the state government announced Mission Millet Chhattisgarh in September 2021. The primary objective is to promote the cultivation of finger millet, small millet, and Kodo millet across 85 blocks in 20 districts of the State. A budget of ₹170 crores has been allocated, with an input grant of ₹9,000 per hectare. The Chhattisgarh Minor Forest Produce Co-operative Federation has been designated as the implementing agency for millet procurement and processing. Additionally, 14 district administrations have entered into an agreement with ICAR-IIMR to support cultivation, procurement, storage, and value addition of millets". The Haryana government's Bhavantar Bharpayee Yojana is a special programme designed to help horticultural farmers make up for the low market price of their produce. To support millet-growing farmers in the State, the Scheme has been elevated to include the Bajra crop starting in the Kharif season of 2021.(13)

In Madhya Pradesh, Under the Center's Nutri Cereal Scheme there is promotion of millets, particularly Kodo and Little millet. A non-profit organisation called Action for Social Advancement (ASA), in the tribal districts has been selected thirty to forty communities of Mandla and Dindori for millet promotion.(14)

The Odisha Millet Mission (OMM), a special initiative by the Odisha government to promote millets in tribal areas, was introduced in 2017 with the dual goals of reviving millets on farms and plates and concentrating on their production, processing, consumption, marketing, and integration into government schemes.(14)

The Tamil Nadu Millet Mission in 2014–15 launched by National Agriculture Development Programme (NADP) with the goal of reviving the once-forgotten millets through incentives for cultivation, distribution, frontline demonstrations, and farmer education on millet farming and value addition. Hence millets play a crucial role in addressing malnutrition and promoting sustainable agriculture in India. The initiatives taken by various state governments, such as Mission Millet Chhattisgarh, the Bhavantar Bharpayee Yojana in Haryana, and the Odisha Millet Mission, reflect a growing recognition of the nutritional and economic benefits of millet cultivation. Furthermore, the health benefits of millets, including their high nutritional content and potential to address issues

such as diabetes and malnutrition, underscore the importance of promoting their consumption. The declaration of 2023 as the International Year of Millets by the United Nations and the Indian government's policy initiatives demonstrates a concerted effort to raise awareness about the significance of millets in achieving sustainable development goals. Therefore, the conclusion is that millets are an essential component of efforts to improve nutrition, ensure food security, and promote sustainable agriculture in India.(14) The many benefits of millets from combating malnutrition to promoting sustainable agriculture emphasize their critical role in accomplishing international health and development objectives.(15)Embracing millet as a staple food holds the potential to promote improved health and resilience for people and communities worldwide as we move toward a future where nutritional security is critical.

Conclusion

Millets are need for the hour especially as India, a well-known millet producer, produces a wide variety because of its diverse climate and topography. Millets, which make up only 10% of India's food grains, are vital in the fight against malnutrition, which is particularly common in children. Millets provide a nutrient-dense, gluten-free alternative as countries struggle with the twin problems of malnutrition and lifestyle-related health problems. The resurgence of millets signifies a pattern shift in the understanding of their nutritional value, providing a long-term remedy for global health issues. The coordinated efforts of communities, organizations, and governments highlight how important millets are for promoting food security and advancing sustainable development objectives. A world where people and communities are healthier is possible if millets are adopted as a staple grain. The United Nations' proclamation of 2023 as the International Year of Millets, along with state-specific initiatives and policy initiatives from India, demonstrate a concerted effort to encourage the cultivation and consumption of millet. Therefore, millets are becoming a good option as a staple food because of their numerous health benefits, lower cost, and excellent fit for low- and middle-income countries.

Authors Contribution

All authors have contributed equally.

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