

6. Millets: A Nutritional Powerhouse for Ensuring Global Food Security

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Abstract:

Millets is one of the most important cereals which belong to the Poaceae family, commonly known as the grass family. This cereal is grown in Developing country like India, Nigeria, China. India is the largest producers of the millets in world. Millets are gaining renewed attention in the quest for sustainable food systems. As the world faces challenges like climate change, soil degradation, and increasing populations, millets emerge as a promising solution for fostering agricultural sustainability. Millets, including varieties such as sorghum, pearl millet, finger millet, and foxtail millet, exhibit remarkable adaptability to different climates and soil types.

Their hardiness allows for cultivation in regions where traditional staple crops may struggle, making them an invaluable resource for communities vulnerable to climate-induced agricultural disruptions.

Millets are Nutri cereals. Millets packed with essential nutrient such as essential fatty acids, protein, dietary fiber, B –vitamin, calcium, iron, zinc, potassium and magnesium. Millets offer a multitude of health benefits due to their rich nutritional profile. Millets are controlling cholesterol, regulate blood pressure, reducing the risk of cardiovascular disease.

The fiber in millets further aids in controlling blood sugar. Millets are naturally gluten-free, making them a safe and nutritious alternative for individuals with celiac disease or gluten sensitivities. Certain millets, such as finger millet (ragi), possess antioxidant properties that help combat oxidative stress in the body. The cultivation of millets aligns with sustainable agricultural practices, as they often require less water and input resources compared to major cereal crops like wheat and rice.

This chapter highlights the potential of millets to contribute significantly to global food security by offering a resilient, nutritionally dense, and environmentally sustainable alternative to traditional staple crops. The integration of millets into agricultural systems can enhance the resilience of food production in the face of climate uncertainties and contribute to the goal of achieving a more sustainable and inclusive global food system.

Keywords:

Millets, sustainable, climates, nutritional, cereal, crops.

6.1 Introduction:

The term ‘Millet’ originated from the Latin word ‘Milum’ means grain. Millets are group of small, grained cereal food crops which are highly tolerant to drought and other extreme weather conditions and are grown with low chemical inputs such as fertilizers and pesticides.

These ancient grains belong to the Poaceae family and are known for their hardiness, adaptability, and nutritional value. Most of millet crops are native of India and are popularly known as Nutri- cereals as they provide most of the nutrients required for normal functioning of human body.

Millets have played a crucial role in the diets and livelihoods of various communities, especially in arid and semi-arid regions where they thrive with minimal water requirements. Millets have a nutritional powerhouse with the capacity to contribute significantly to the global food security agenda.

This chapter delves into the various facets of millets, highlighting their nutritional value, agronomic benefits, and potential role in ensuring food security worldwide. On March 5, 2021, the United Nations proclaimed 2023 as the International Year of Millets in response to a proposal made by India and endorsed by 72 other nations.

It is imperative that we honor humanity's traditional wisdom in this way. These are the original domesticated plants used for food. The Food and Agriculture Organization (FAO)

of the United Nations hosted the International Year of Millets (IYM) 2023 in Rome, Italy, on December 6, 2022. To accomplish IYM 2023 and take Indian millets global, the Department of Agriculture & Farmers Welfare has adopted a proactive multi-stakeholder engagement approach, involving all central government ministries, states/UTs, farmers, start-ups, exporters, retail businesses, hotels, Indian embassies, etc. States, ministries, and embassies of India

6.2 Classification of Millets:

On the basis of the size of the millets are classified in two groups. Large (Major) Millets: Jowar (Sorghum), Bajra (Pearl Millet), Finger Millet (Ragi). Foxtail Millet (Kagni), and Proso (Cheena) Millet. Small (Minor) Millet: Kodo Millet (Kodra), Barnyard Millet (Sama), Browntop Millet (Hari Kagni), Little Millet (Kutki). India millets production- India is the largest producer of millets in the world. India's two varieties of millets namely Pearl Millet (Bajra) and Sorghum (Jowar) together contribute approx. 19 per cent in world production in 2020.

India's Pearl Millet production accounts for 40.51 per cent followed by Sorghum 8.09 per cent in the world production of Millets in 2020.

In India, Jowar and Bajra are grown in most states like Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh, and Tamil Nadu, except Northeast states, Himachal Pradesh and Jammu and Kashmir. Both can be grown as Kharif (July -November) and Rabi (October – February) crops. Traditional varieties of these crops are available in India. Finger millets (ragi) is most important millets. It is mostly grown in "Karnataka."

Nutritional Powerhouse:

Nutrient Composition of millets- Sorghum (bajra):

- It is rich in protein, fiber, thiamine, riboflavin and Beta –carotene.
- It is rich in potassium, phosphorus and calcium with sufficient amount of iron, zinc and sodium.

Pearl Millet (bajra):

- Pearl millets contain high amount of protein (12-16%) as well as lipid.
- It contains 11.5% dietary fiber which reduces the risk of inflammatory bowel disease.
- The niacin content in pearl millets is higher than all other cereals.
- It also contains foliate, magnesium, iron, copper, zinc, vitamin E, B-complex, calcium.

Finger Millet (Ragi):

- Finger millets richest source of calcium (300-350 mg/100gm)
- Ragi is the highest mineral content.
- It contains lower level of protein.
- Ragi protein is unique because it contains sulphur rich amino acid.
- The antioxidant activity of ragi is high.

Kodo Millet (Kodon):

- Kodo millets contain high protein, low fat and high fiber (14.3).
- Rich in niacin, pyridoxin, folic acid, calcium, iron, potassium, magnesium and zinc.
- Kodo millets contain high amount of “lecithin” which is excellent for strengthening the nervous system.

Barnyard Millet (Sanwa):

- Barnyard millet is a good source of highly digestible protein and makes one feel light and energetic after consumption.
- Rich source of crude fiber and iron.
- It is rich in antioxidants like Beta –Glucan and Gamma amino butyric acid (GABA).

Little Millet (kutki/shavan):

- It is rich in iron.
- It contains dietary fiber (38%)

- It is smaller than other millets.
- The antioxidant activity of the little millet is very high.

Buckwheat (kuttu):

- Buckwheat mainly consists of carbohydrates.
- It contains vitamin B1, vitamin C and vitamin E.
- It is also rich in polyunsaturated fatty acid.
- Protein content is 13-15%.

6.3 Health Benefit of Millets:

- Health-promoting nutritious crop: Compared to other cereals they have superior micronutrient profile and bioactive flavonoids.
- Millets have a low Glycaemic Index (GI) and also associated with the prevention of diabetes.
- Millets are gluten-free and can be consumed by celiac disease patients.
- Millets has a beneficial effect on the management and prevention of hyperlipidemia and risk of CVD.
- Millets are anti acidic.
- Millets reduces the risk of gastric ulcers and colon cancer.
- Millets are found to be helpful with the reduction of weight, BMI, and high bloodpressure.
- Millet based value-added products in ready to cook, ready to eat category are easily accessible and convenient to the urban population.
- Millets are used for dual purposes as food as well as fodder, which make it more farming efficient.
- Millet cultivation helps to reduce the carbon footprint.
- In India, Millet is generally consumed with legumes, which creates mutual supplementation of protein, increases the amino acid content, and enhances the overall digestibility of protein.

Table 6.1: A Comparative Chart Showcasing the Nutritional Value of Millets in Comparison to Wheat and Rice.

| Food grain | Protein (g) | Fat (g) | Crude fiber (g) | Minerals | | Sulfur containing amino acids | | Unsaturated fatty acids | | |
|-------------------|-------------|---------|-----------------|----------|--------|-------------------------------|----------|-------------------------|----------|-----------|
| | | | | Ca(mg) | Fe(mg) | Methionine | Cysteine | Oleic | Linoleic | Linolenic |
| Finger millet | 7.3 | 1.3 | 3.6 | 344 | 3.9 | 210 | 140 | - | - | - |
| Kodo millet | 8.3 | 1.4 | 9.0 | 27 | 0.5 | - | - | - | - | - |
| Proso millet | 12.6 | 1.1 | 2.2 | 14 | 0.8 | 160 | - | 53.80 | 34.90 | - |
| Foxtail millet | 12.3 | 4.3 | 8.0 | 31 | 2.8 | 180 | 100 | 13.0 | 66.50 | - |
| Little millet | 7.7 | 4.7 | 7.6 | 17 | 9.3 | 180 | 90 | - | - | - |
| Barnyard millet | 6.2 | 2.2 | 9.8 | 20 | 5.0 | 180 | 110 | - | - | - |
| Sorghum | 10.4 | 1.9 | 1.6 | 25 | 4.1 | 100 | 90 | 31.0 | 49.0 | 2.70 |
| Bajra | 11.6 | 5.0 | 1.2 | 42 | 8.0 | 150 | 110 | 25.40 | 46.0 | 4.10 |
| Wheat (whole) | 11.8 | 1.5 | 1.2 | 41 | 5.3 | 90 | 140 | 11.50 | 56.30 | 3.70 |
| Rice (raw milled) | 6.8 | 0.5 | 0.2 | 10 | 0.7 | 150 | 90 | 42.50 | 39.10 | 1.10 |

(Source: Indian Food Composition Tables, Nin -2017; *Nutritive Value of Indian Foods Nin-2017)

6.4 Climate Resilience of Millets:

Climate resilience is a critical aspect of agriculture, especially in the face of the changing climate patterns and extreme weather events. Millets, a group of small-seeded grasses, demonstrate remarkable climate resilience, making them a valuable asset for sustainable agriculture. millets are known for their adaptability to a wide range of agro-climatic conditions.

These crops can thrive in regions with high temperatures, low rainfall, and poor soil fertility. Their ability to grow in diverse environments makes them resilient to the uncertainties associated with climate change. In contrast to some traditional cereal crops, millets can withstand heat stress and water scarcity, making them well-suited for cultivation in arid and

semi-arid regions. Millets often have shorter maturity cycles compared to major cereals like rice and wheat, allowing farmers to adjust planting schedules based on changing climatic patterns. This flexibility is crucial in mitigating the risks associated with unpredictable weather events, including droughts or unseasonal rainfall.

Millets also exhibit a high level of pest and disease resistance, reducing the dependency on chemical inputs that may be impacted by changing climatic conditions. This natural resistance contributes to the overall sustainability of millet cultivation and aligns with the principles of agroecology, promoting environmentally friendly farming practices. So, the climate resilience of millets is a result of their adaptability to diverse environments, short growing cycles, pest resistance, and positive impact on soil health. As climate change continues to pose challenges to global agriculture, incorporating millets into farming systems becomes an essential strategy for building resilience, ensuring food security, and promoting sustainable agricultural practices.

6.4.1 Global Food Security:

Diversification of Diets: Millets play a pivotal role in diversifying diets by offering a nutrient-rich alternative to traditional staples. Their unique nutritional composition, including high levels of proteins, fibers, and essential minerals, addresses dietary deficiencies. Incorporating millets into daily meals enhances nutritional diversity, mitigates hidden hunger, and promotes overall health. As a gluten-free option with a low glycemic index, millets cater to a broader range of dietary needs, making them invaluable in creating resilient and varied food systems worldwide.

6.4.2 Global Trade and Economic Opportunities:

The cultivation and promotion of millets present significant global trade and economic opportunities, contributing to the diversification of agricultural markets and offering various economic benefits. Millets, with their adaptability and nutritional value, have the potential to play a pivotal role in the global economy. One of the key economic opportunities lies in the export potential of millets. As awareness of the nutritional benefits of millets grows, there is an increasing demand for these crops in international markets.

Countries that are traditionally millet producers can capitalize on this demand, creating new avenues for trade and economic growth. Moreover, the gluten-free nature of millets makes them appealing to consumers with dietary restrictions, opening up niche markets that can further boost exports.

The global food industry is undergoing a shift towards healthier and more sustainable options. Millets, being nutrient-rich and environmentally sustainable, align with these trends. This opens up opportunities for the development of millet-based products, such as flour, snacks, and cereals, which can be marketed globally.

Entrepreneurs and businesses can explore innovative ways to incorporate millets into the food industry, creating value-added products that cater to health-conscious consumers.

The cultivation of millets also presents economic opportunities at the local level, particularly for smallholder farmers. By promoting millet farming, especially in regions where it is well-adapted, governments and organizations can empower local communities, enhance rural livelihoods, and contribute to poverty reduction.

Furthermore, investing in research and development to improve millet varieties and processing techniques can stimulate economic growth. The development of high-yielding and climate-resilient millet varieties, coupled with efficient processing methods, can increase productivity and create a more competitive market for millet-based products.

So, the global trade and economic opportunities of millets extend from international exports to the development of value-added products and the empowerment of local communities.

6.5 Conclusion:

As the world faces unprecedented challenges in achieving food security, millets emerge as a promising solution. Their nutritional richness, adaptability, and sustainability make them a vital component of the global effort to ensure a resilient and diverse food supply.

Embracing millets in agricultural practices, dietary patterns, and policy frameworks is crucial for building a more secure and sustainable future for the world's growing population.

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