Scientific Innovation Magazine
ISSN : 2584-1157

Millets: a solution for Nutritional challenges

Srabani Ghosal

Department of Agricultural Extension Education , Orissa University of Agriculture and Technology , Bhubaneswar

Email: srabani.5ghosal@gmail.com

ABSTRACT:

Millets, a group of small-seeded, resilient grasses, have been integral to global agriculture for millennia. This paper explores the agrarian importance of millets, emphasizing their role in sustainable farming practices and their contribution to global food security. Millets exhibit remarkable climate resilience, thriving in challenging environments and requiring minimal water, making them a valuable crop in regions prone to drought and high temperatures. Their deep root systems contribute to soil health and structure, promoting sustainable agricultural practices.

In addition to their agrarian significance, millets play a pivotal role in addressing nutritional challenges. Rich in essential micronutrients, proteins, and dietary Fiber, millets contribute to food security and combat malnutrition. Their low input requirements and ability to diversify cropping systems make them a cost-effective and environmentally sustainable option for farmers.

BACKGROUND:

Humanity has entered a new phase of contemporary civilization due to advancements in science and technology. The integration of innovative research methodologies into both basic and applied research has resulted in a comprehensive advancement. Mechanization, irrigation systems, synthetic fertilizers and pesticides, high yielding variety research and selection, and other well-planned technical advancements in agriculture have made enough food availability. Global cereal production was projected to reach 2597 million tons in 2017 , up from an estimated 2605 million tons in 2016. A number of ill-advised policies have increased output at the expense of sustainability and the capacity of the resource base, resulting in saline soil lacking in nutrients

and declining water levels. Furthermore, shifting climate conditions have increased farmers' susceptibility to decrease in crop production.

Approximately one-third of the world's population lives in drylands, which make up 40% of the planet's land area. By 2100 AD, it is estimated that these poor, productive soils would have increased by 50–56%, with developing nations expected to account for 78% of the expansion of dry land . Around 815 million people globally struggle with hunger, according to a World Bank report . India, a nation heavily dependent on agriculture, has seen a spike in farmer suicides, with an average of 52 deaths per day. Reports of farmers in drought-affected areas of the nation selling their blood to make ends meet also highlight the severity of the agrarian situation .

It is common that millets play a key part in the creation of contemporary foods like multigrain and gluten-free cereal goods . Millets are thought to be a part in lowering the rate of fat absorption, slowing the release of sugars (low glycaemic index) which helps in reducing risk of heart disease, diabetes, and high blood pressure because of their richness in polyphenols and other biologically active substances. Owing to growing knowledge about the health benefits of millet, there has been a discernible trend toward its consumption. The current review considers the nutritional value, agrarian needs, and health advantages that these grains provide.

AGRARIAN IMPORTANCE OF MILLETS :

Millets hold significant agrarian importance for several reasons, contributing to the agricultural landscape and the livelihoods of farmers in various regions. Here are key aspects highlighting the agrarian importance of millets:

- **Climate Resilience:** Millets are known for their resilience to adverse climatic conditions such as drought, high temperatures, and poor soil fertility. They can thrive in semi-arid and arid regions where other crops might struggle, providing a reliable food source for farmers in challenging environments.
- **Water Efficiency:** Millets are generally more water-efficient compared to some other major cereals like rice and wheat. Their ability to grow with lower water requirements makes them suitable for cultivation in water-scarce regions.

- **Diversification of Agriculture:** Introducing millets into cropping systems helps diversify agricultural practices, reducing dependency on a few major crops. Crop diversification can enhance resilience to pests, diseases, and market fluctuations.
- **Soil Health:** Millets, with their deep root systems, can improve soil structure and nutrient cycling. Their cultivation can contribute to maintaining soil health and fertility'
- **Low Input Requirements:** Millets often have lower input requirements, such as fertilizer and pesticide use, making them a cost-effective option for farmers. Reduced input costs can contribute to the economic sustainability of farming operations.
- **Food Security:** Millets have been traditional staple foods in many regions, contributing to the food security of communities. Their nutritional profile, rich in micronutrients and dietary Fiber, adds to their importance in addressing malnutrition and enhancing overall health.
- **Livestock Feed:** Millet straw and residues can be used as valuable fodder for livestock, contributing to the integrated farming systems prevalent in many agricultural communities.
- **Income Diversification:** Cultivating millets can provide farmers with an additional income stream. The diverse uses of millets, such as in food, fodder, and traditional products, offer multiple economic opportunities for farmers.
- **Cultural and Culinary Significance:** Millets often hold cultural and culinary importance in many communities, contributing to the preservation of traditional practices and biodiversity.
- **Global Food Security:** Given their adaptability to diverse agro-climatic conditions, millets contribute to global food security by serving as a resilient and sustainable crop option.

Efforts to promote millets in agriculture involve research, policy support, and awareness campaigns to highlight their agrarian importance and encourage their cultivation. As millets gain

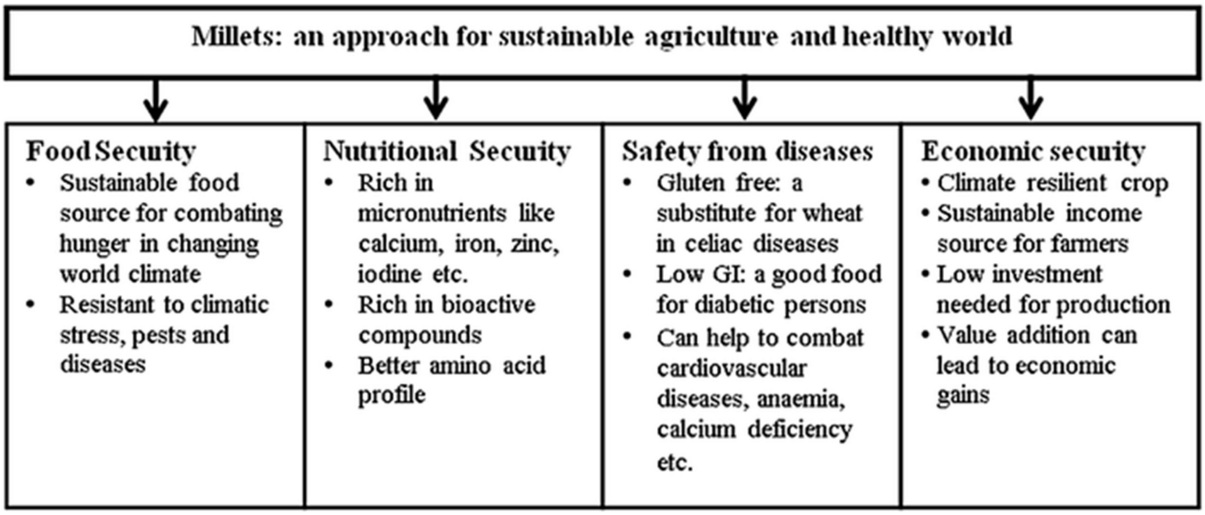
recognition for their nutritional benefits and adaptability, they play a crucial role in sustainable and resilient farming systems.

NUTRITIONAL IMPORTANCE OF MILLETS :

The globe is currently experiencing a number of chronic illnesses and health problems. According to the 2016 Global Nutrition report, adult overweight, adult obesity, and very significant undernutrition affect 44% of the population in 129 countries (data available) . A diet deficient in certain nutrients is the cause of the majority of these illnesses. The Food and Agriculture Organization of the United Nations estimates that in 2015, over 795 million people, or 10.9% of the global population, were undernourished. Conversely, approximately 1.9 billion adults (or 39% of the world's population) who were at least 18 years old were overweight, while an additional 13% were believed to be obese .

According to reports, the average body mass index (BMI) of the global population was 24 kg/m2 in 2014, which is higher than the 21–23 kg/m2 WHO guidelines for optimal health . The World Health Organization has already classified diabetes and cardiovascular illnesses as epidemics that are caused by obesity. The majority of the world's undernourished people live in India. Approximately 194.6 million individuals, or 15.2% of India's total population, suffer from malnutrition. In the 2017 Global Hunger Index study, India came in at number 100 out of 119 nations. India's score is lower than that of Bangladesh, Nepal, and Sri Lanka . According to reports, protein energy malnutrition (PEM) caused 4,69,000 deaths, of which 84,000 were attributable to deficiencies in other essential nutrients as iron and iodine.

Scientific Innovation Magazine
ISSN : 2584-1157



MILLET AS MACRONUTRIENT :

Millets are not only rich in micronutrients but also serve as a good source of macronutrients. The macronutrients in millets include carbohydrates, proteins, and dietary Fiber. The specific composition may vary among different types of millets, but here are some general aspects of millets as macronutrients:

- Carbohydrates: Millets are predominantly composed of carbohydrates. They provide a complex carbohydrate source, which means they contain starches and fibres that contribute to sustained energy release. Carbohydrates are the primary source of energy for the body.
- Proteins: Millets are a good source of plant-based proteins. The protein content varies among different types of millets, with some such as finger millet (ragi) and pearl millet having relatively higher protein content compared to others. The protein in millets is important for muscle development, repair, and various physiological functions.
- Dietary Fiber: Millets are rich in dietary Fiber, which is beneficial for digestive health. Dietary Fiber helps in regulating bowel movements, preventing constipation, and promoting a feeling of fullness. The Fiber content in millets also contributes to the slower

release of glucose into the bloodstream, which can be beneficial for managing blood sugar levels.

- Fats: Millets generally contain a lower amount of fats compared to some other grains. The fat content is typically in the form of healthy unsaturated fats. Millets can be a good option for those looking to manage their fat intake while still obtaining essential nutrients.
- Low Glycaemic Index (GI): Millets, particularly those like pearl millet and finger millet, have a lower glycaemic index compared to refined grains. This means they have a smaller impact on blood sugar levels, making them suitable for individuals with diabetes or those aiming to regulate blood sugar.

It's worth noting that the exact macronutrient composition can vary between different types of millets, such as sorghum, pearl. millet, finger millet, foxtail millet, and others. Including a variety of millets in your diet can provide a diverse range of nutrients and contribute to a balanced intake of macronutrients.

MILLET AS MICRONUTRIENT:

Millets are small-seeded grasses that have been cultivated for thousands of years as a food source. They are known for their nutritional benefits and are considered a good source of various micronutrients. Here are some key micronutrients found in millets:

- Iron: Millets, especially pearl millet and finger millet, are rich in iron. Iron is crucial for the formation of haemoglobin, which carries oxygen in the blood.
- Zinc: Millets contain zinc, an essential micronutrient that plays a role in immune function, wound healing, and DNA synthesis. Foxtail millet, in particular, is known for its zinc content.
- Magnesium: Magnesium is important for muscle and nerve function, blood sugar control, and bone health. Various millets, such as sorghum and pearl millet, contain significant amounts of magnesium.

- Calcium: While millets are not as high in calcium as dairy products, they still contribute to the overall calcium intake. Finger millet, in particular, is known for its relatively higher calcium content.
- Phosphorus: Millets contain phosphorus, a mineral important for bone health, energy metabolism, and the formation of DNA. Pearl millet, for instance, is a good source of phosphorus.
- Copper: Copper is involved in the formation of red blood cells, maintenance of bones and connective tissues, and supports the immune system. Various millets contain copper, though the amounts may vary.
- B Vitamins: Millets are a good source of various B vitamins, including B1 (thiamine), B2 (riboflavin), B3 (niacin), B6 (pyridoxine), and folate. These vitamins play essential roles in energy metabolism, nerve function, and DNA synthesis.
- Antioxidants: Some millets, such as finger millet (ragi), contain antioxidants like phenolic compounds, which have potential health benefits, including protecting cells from oxidative stress.

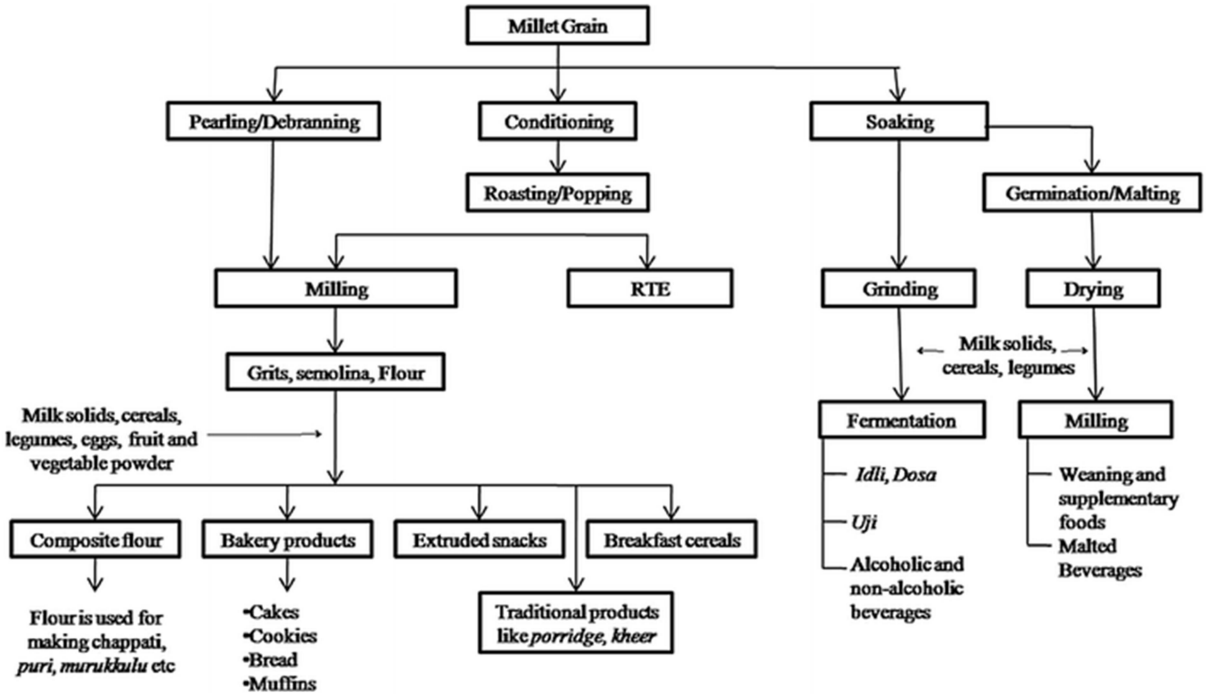
EFFECTS OF PROCESSING OF MILLETS :

Processing millets enhances nutrient bioavailability while reducing antinutritional elements in the grain. Traditionally, a variety of processing techniques have been employed, including soaking, germination, fermentation, and roasting/popping . It has been noted that each of these techniques significantly affects the grain's nutritional content. Malting millet enhances nutrient availability and has been shown to boost iron and manganese bioavailability by 300% and 17%, respectively . Because the hydrolytic activity of the enzyme phytase increases during germination, the anti-nutritional factors drastically decreased with an increase in germination time.

Germination of millets can lower their phytate content because it causes the phosphorus in phytate to be hydrolysed into inositol monophosphate, which lowers the phytic acid amount. Tannin levels decrease as a result of the tannins being leached during the soaking and

Scientific Innovation Magazine
ISSN : 2584-1157

germination of grains . Tannins are also reduced by pressure cooking and boiling. It is commonly recognized that fermentation increases the digestion of protein by lowering anti-nutritional elements. Additionally, radiation has been found to have an inhibitory effect on anti-nutrients and to improve the digestion of proteins . It has been observed that extrusion cooking or high temperature short time (HTST) processing decreases anti-nutrients such tannins and phytates while increasing the bioavailability of minerals .



Schematic diagram for developing millet-based composite foods\

CONCLUSION :

Extreme environments, such as drought, are easy for millets to flourish in but some wild species can even live in flooded places and swampy grounds. These are high in antioxidants, B vitamins, and minerals (calcium, iron, copper, magnesium, etc.). They also have a low glycaemic index and contain gluten-free protein. They are nutrient-dense and climate change-tolerant crops because of these remarkable qualities these can benefit communities' general health in addition to providing farmers with a source of revenue. Scientific interventions have the potential to address

current limitations, such as the existence of anti-nutritional components and low sensory acceptance of millet-based products. Cooking, roasting, germination, and fermentation are examples of processing techniques that can render the anti-nutritional components inactive. By combining millet flours with other flours that have a high acceptability level and creating composite foods, it is possible to improve the sensory acceptability of millet-based goods. Farmers will be encouraged to plant millets by the usage of millets in commercial and packaged food, which will also create new opportunities and boost the farmers' livelihoods. Incorporating millet-based food items into feeding programs at the international, national, and state levels will aid in mitigating the current nutrient deficits in developing nations, namely in protein, calcium, and iron.

REFERENCES :

1. FAO. World food situation; 2017. http://www.fao.org/worldfoodsituation/csdb/en/. Accessed 25 Jul 2017.
2. Huang J, Haipeng YH, Xiaodan GX, Wang G, Guo R. Accelerated dryland expansion under climate change. Nat Clim Change. 2016;6:166–71.
3. ICRISAT. Small Millets. http://www.icrisat.org/homepage. Accessed 16 Apr 2017.
4. ICRISAT. ICRISAT adds finger millet as its 6th mandate crop; 2015. http://www.icrisat.org/newsroom/news-releases/nr-2015/ICRISAT-adds-finger-millet-6th-mandate-crop.pdf. Accessed 23 May 2017.
5. World Bank. Agriculture and Food; 2017. http://www.worldbank.org/en/topic/agriculture/overview. Accessed 22 Mar 2018.
6. Sharma D. More than make in India, Jaitley needs to focus on farm in India. The wire; 2016. https://thewire.in/22520/budgeting-for-agriculture-and-revitalising-the-economy/. Accessed 23 Jan 2018.
7. Kajuna. STAR MILLET: Post-harvest operations. Food and Agricultural Organization, United Nations; 2001. http://www.fao.org/3/a-av009e.pdf. Accessed 27 Oct 2017.

8. Saleh ASM, Zhang Q, Chen J, Shen Q. Millet grains: nutritional quality, processing, and potential health benefits. Compr Rev Food Sci Food Saf. 2013;12:281–95

9. Awika JM. Major cereal grains production and use around the world. In: Advances in cereal science: implications to food processing and health promotion. American Chemical Society; 2011. p. 1–13.