



The sustainability of millets and the advantages they bring for human health

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Abstract

Traditional grains known as millets have been farmed and eaten in the Indian subcontinent for more than 5000 years. Yajurvedic scriptures dating back thousands of years contain allusions to millets, including those for foxtail millet (priyangava), barnyard millet (aanava), and black finger millet (shyaamaka). The majority of millet crops are indigenous to India and are referred to be "nutri-cereals" since they contain the majority of the nutrients needed for the body to operate normally. Sorghum, pearl millet, finger millet, foxtail, tiny, kodo, proso, and barnyard millet are among the nutrient-dense cereals known as millets. These are one of the oldest foods known to humanity. Millets were on the dining table of Indians until 50 years ago. It was a staple food and integral part of local food cultures and traditions. But, just like many other things, millets have come to be looked down upon by modern urban consumers. Millets too have been discarded as being too primitive to be used, forgetting the roots. Before Green Revolution, millets made up around 40 percent of all cultivated grains in India (contributing more than wheat and rice).

Keywords: Nutrient composition, Beneficial for farmer, Utilization of millet protein and human health, Benefits of millet in diet, Nutritional Importance of millets

Introduction:

Government of India had proposed to United Nations for declaring 2023 as International Year of Millets (IYOM). The proposal of India was supported by 72 countries and United Nation's General Assembly (UNGA) declared 2023 as International Year of Millets on 5th March, 2021. In order for Indian



millet, recipes, and value-added goods to be recognised

internationally, the Indian government has now chosen to celebrate IYOM in 2023. Kodo, Kutki, and Ragi are only available in Chhattisgarh State and are purchased there for the Minimum Support Price (MSP) in



Figure: Field view in the SHUATS, Prayagraj.

an effort to promote millets. To aid the state's tribal people and other farmers, kodo-kutki is being purchased at a cost of Rs. 3,000 per quintal, while ragi is being purchased at a cost of Rs. 3,377 per quintal. The "Millet Mission" initiative, which the Chhattisgarh government launched in collaboration with the Indian Institute of Millet Research in Hyderabad, aims to give farmers the right price for small cereal crops, as well as to help them with input costs, procurement plans, processing, and ensuring that they can take advantage of experts' knowledge. Since millets are the only crops that guarantee yields during famines, they are sometimes referred to as "famine crops". Due to the fact that they are the last to be planted, there is less of a market for them, and they also produce poorer returns than other crops, these crops were formerly referred to as orphan crops. However, these underutilized crops are important for helping us vary our diets and ensuring that the poor have access to food, nutrition, and a means of sustenance in various parts of the world. Millets are a kind of cereal food-grain crops with small seeds that can be grown in a variety of tropical and subtropical climates and can be grown with minimum input. In Asia and Africa, these were the first plants that people tamed, and they later spread to other areas of the world as important food sources for rising civilizations. They are nutrient-rich and offer consumers a number of health benefits. Due to their high nutritional value, established health benefits, and adaptability to a variety of environmental situations, millets have recently gained in significance. The regional food system and culture of countries in Asia and Africa are represented by millets, which also make a significant contribution to sustainable agriculture and a healthy environment. The Indian government declared the year 2018 to be its "National Year of Millet" in an effort to enhance the



wellbeing of the country. According to FAOSTAT, 2020, India produces the most (47%) of the world's millet, and it has identified the three main kinds of millet: main, minor, and pseudo.

Table 1. Nutrient composition of millets per 100 g

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Grain/nutrient	Bajra	Jowar	Ragi	Fox tail millet	Proso millet	Barnyard millet	Kodo millet
Energy	361	349	328	331	341	397	309
Protein (g)	11.6	10.4	7.3	12.3	7.7	6.2	8.3
Fat (g)	5.0	1.9	1.3	4.3	4.7	2.2	1.4
Calcium (mg)	42.0	25.0	344	31.0	17.0	20.0	27.0
Iron (mg)	8.0	4.1	3.9	2.8	9.3	5.0	0.5
Zinc (mg)	3.1	1.6	2.3	2.4	3.7	3.0	0.7
Thiamine (Vit. B ₁) (mg)	0.33	0.37	0.42	0.9	0.21	0.33	0.33
Riboflavin Vit. B ₂ (mg)	0.25	0.13	0.19	0.11	0.01	0.10	0.09
Folic acid (mg)	45.5	20	18.3	15.0	9.0	-	23.1
Fiber (g)	1.2	1.6	3.6	8.0	7.6	9.8	9.0

Good for farmer: Since many millets ripen in only 60 to 90 days compared to the 100 to 140 days required by fine grains, millet aids smallholders in implementing effective crop rotation.

Resource Efficiency: The production of millet can increase by up to threefold since it uses the available nutrients effectively and responds well to modern agricultural practices and additional inputs.

Climate Resilience: The most reliable crop for small farmers is millet since it can withstand harsh conditions, high temperatures (up to 64 °C), and arid climates. During a drought, they are frequently the last crops to remain standing. Seasons and sustainable food sources are in jeopardy due to the world's worsening climate.

Utilization of millet protein:

Proteins have numerous functions in food. Flexibility, solubility, foaming, oil binding, flavour binding, and coagulation are among the functional qualities. To create meat replacements, protein with a higher coagulation rate is needed. To meet the rising need for protein-rich meals, plant-based proteins like those found in millet are becoming more and more relevant in scientific circles. However, millet-based proteins are no longer often used in cooking. Nowadays, proteins made from millet are rarely used



in cooking. Millet protein is moreover a component of extract, separated hydrolysate, etc. Millet protein can be used to make a variety of gluten-free foods and beverages, including pasta, bread, beverages, and premixes, and has been demonstrated to improve the protein content of the finished product.

Effectiveness of millet protein for human health

A crucial job is done by millet protein in human metabolism. Additionally, millet protein may be examined for usage in ingredients for toddlers and weaning as well as in healing formulations intended for disease management. For diabetic people, millet's slow-digesting carbs help control their blood sugar levels. Millets are high in dietary fiber, which lowers blood cholesterol levels, prevents cardiovascular disease, and helps people stay fuller longer. All ages are advised to consume millet protein since it helps persons with hypo allergens, has a low gluten level, and prevents celiac disease. The appropriateness of millet protein can be evaluated in order to create dietary products that are conducive to good health. Antioxidants found in millet reduce oxidative stress and guard against Alzheimer's disease and early ageing.

Future challenge for entrepreneurship

If millet protein products are to be commercialized, the research community needs to address a number of problems, including information gaps, consumer behavior, and the protein food manufacturing unit, among others. These factors include the availability of examining the protein's/its product's action in vivo research carried out in human models, for example, the impact of ingesting a protein supplement or its by-products on hunger, sufficiency, or specific illness states; acceptable product forms like powder, granule, bar, or liquid from protein foodstuffs; etc. Five other important criteria include the recommended daily protein intake, consumer comprehension of proper dietary protein intake, and potential health advantages of protein consumption. Additionally, it is crucial to know whether consumers are willing to switch from millet amino to more lasting cattle proteins and whether they possess the culinary skills necessary to include these proteins in sufficient proportions in appropriate nutritive media. As a result, the best technique for making these proteins acceptable to consumers must be selected. The protein extract production unit must also take into account post-milling processing mechanisms, such as high protein content, proportions, assimilation, biodegradability, pathogenicity, resulting from the chemical compounds/enzymes or microorganisms involved (if any), and performance characteristics just at the time of manufacture (capacity to be incorporated into food), manufacturing costs, specific dietary variables, sustainable development, and methods to i As a result, a



paradigm for gradually substituting millet-based protein products for animal protein meals in daily nutrition will be devised.

Need for value addition of millets

- To meet the taste/preferences of the consumers.
- Reducing post-harvest losses.
- Nutrient enhancement.
- Ready to eat (RTE), ready to Cook (RTC) – Reduces the cooking time.
- Enhance shelf life and make the product available for a long time.
- Diversified Millet products can solve our food needs as climate changes.
- Improving the consumption of millet products can help to overcome malnutrition.
- Millet farmers will have more post-harvest technologies thus enhancing the economic value of millet as well as improving the status of farmers.

Benefits of millet in diet

A small-seeded cereal crop grown extensively in India is millet. In Tamil and Malayalam, it is referred to as Bajra, Kamboo; in Telugu, Sajjalu; and in Marathi and Gujarati, Bajri. The tiny, golden-yellow grains are typically used for hay, pasture, seed crops, and nourishment. It is ideally suited for cultivation in severe, arid climates and areas that are prone to drought since it grows quickly. In the Indian states of Rajasthan, Maharashtra, Gujarat, Haryana, and Uttar Pradesh, pearl millet is frequently consumed as a significant cereal grain. Fonio, finger millet (ragi), foxtail, and kodo millet are a few additional common millets in addition to pearl millet. Impressive nutritional characteristics may be found in these millets.

Nutritional importance of millets

Gluten-free: A diet based on pearl millet is gluten-free, making it an option for people with celiac disease and gluten intolerance. Along with rice and corn, wheat is the most popular cereal in the world. Wheat also contains the protein gluten, which can lead to gastrointestinal issues like bloating, flatulence, and irritable bowel syndrome.

Reduces Cholesterol: These grains are beneficial for heart patients due to their high dietary fibre content and cholesterol-lowering effects. The phytic acid in pearl millet accelerates the metabolism of cholesterol and stabilizes the body's level of cholesterol. Niacin, a nutrient that lowers cholesterol, is also present.



Omega-3 Fats: Compared to other cereals, it provides a better source of beneficial omega-3 fatty acids. Omega-3 fatty acids are recognized to be cardio protective and have been linked to reduced blood pressure, triglycerides, slowed artery plaque growth, and regular heart rhythm. Potassium, which is essential for people with high blood pressure, is also abundant in bajra. Increasing your intake of foods high in potassium lowers blood pressure through aiding in the body's removal of sodium.

Relieves Constipation: Pearl millet's high fiber content helps to relieve constipation and the digestive process. Children with persistent constipation may consume little amounts of pearl millet on a regular basis.

Other Benefits: Lactating mothers' benefit from eating pearl millet. To improve milk production, lactating moms must eat pearl millet. Furthermore, pearl millet has three times as much calcium as milk does. Therefore, pearl millet eating is advantageous for both mothers and their newborns. Foxtail millet has anti-lipidemic and anti-hyperglycemic properties. Due to their high tocopherol content, millets have a higher antioxidant potential and are an excellent source of carotenoids (78-366mg/100g).

Conclusion

Millets may grow well in harsh environments like drought, and some wild kinds can even survive in flooded fields and marshy environments. These exceptional qualities make them nutrient-dense and resistant to climate change crops. These can benefit the health of the community as a whole in addition to providing farmers with a source of revenue. Since rice and wheat were cultivated on a much bigger scale as a result of industrialization and urbanization, millets' importance and cultivation were reduced. Millets are the oldest foods still consumed by humans. Millets have reemerged as a viable option for maintaining a balanced diet and can reduce the occurrence of some metabolic illnesses, such as diabetes, hypertension, and cardiovascular disease. These disorders are becoming more prevalent as a result of newly chosen lifestyles and eating habits. In particular, millets' high fibre content and starch-based nature, which play a significant role in reducing the risk of diabetes and other related illnesses, offer a variety of nutritional, nutraceutical, and health-promoting features.

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