A Comprehensive Review on Millets: A Potential Source of Energy and Nutrients for Health

Abstract

Millets, Cereals and grains, are essential for providing appropriate nutrients and have been shown to be beneficial effect for disorders of lifestyle. The society's knowledge of nutrition and health care research substantiates the potential of photochemicals, such as polyphenols and dietary fibers, on their health beneficial properties, so there is no need to search for newer sources of energy and other natural and nutritional material with the desired functional characteristics. It is a crucial staple food crop in India, especially for low-income families. Its value in terms of nutrition is widely known because to its high content of phenolic compounds (0.03%–3%), dietary fibre (18%), and calcium (0.38%).

Keywords: Millets, Energy sources, Nutritional value, Health importance

Introduction

The word “Millets” (A Nutritive Crop) is beneficial to numerous grass crops whose seeds are picked for human food or animal feed (Thapliyal *et al*., 2015).

Millet is most important cereal after rice, sorghum and wheat and it is a most necessary food for thousands of years in many parts of Africa and India. Lots of persons around the world mostly persons who alive in hot, tropical environments, trust deeply on millets as a sustenance source. As they can bloom in challenging environmental conditions like little precipitation, millets are a main meal in many developing states. For lots of publics living in arid zones, millet helps as their major source of protein and energy. Millet is known to have a variety of nutritional and therapeutic uses. (Obilana and Manyasa, 2002; Yang *et al*., 2012).

Millets are extremely nutritious yet are frequently overlooked as a main source of food, mostly because people are unaware of them. Millets have increased abundant significance in the realm of biomedical study, however, as a result of growing indication that they have helpful things on human fitness (Rao *et al*., 2011).

Millets are slight, round grains with a high nourishing content that are mainly made up of crude fibre (2–7%), protein (7–11%), and fat (1.5–5%). Moreover, millets are free of gluten and high in zinc, magnesium, iron, calcium, and vitamin B. (Majid *et al*., 2019).

The United Nation officially recognizes 2023 as the "International Year of Millets" in response to India's request. The "National Year of Millets" has previously been celebrated in India during 2018. The statements seek to increase the community's understanding of millets' importance for food security and nourishment as well as to build up their high-quality, environmentally friendly production.

Millets typically come in seven different varieties, each with unique colours, shapes, sizes, and growing regions. The Poaceae family includes these small-seeded, spherical cereals, which are the earliest and most likely the first cereal grain that humans have used for domestic purposes (FAO, 2020). The grain with the sixth-highest yield in the world is millet. India is the world's second-largest exporter of millets and its primary producer. The Foreign Agricultural Service of the United States Department of Agriculture reports that as of February 2023, India produced 39% of the millets grown globally for the year 2022. The Nutritional compositions of millets have been given in Table. 2 and depicted in fig.1.

Table 1: Types of Millets and its Name

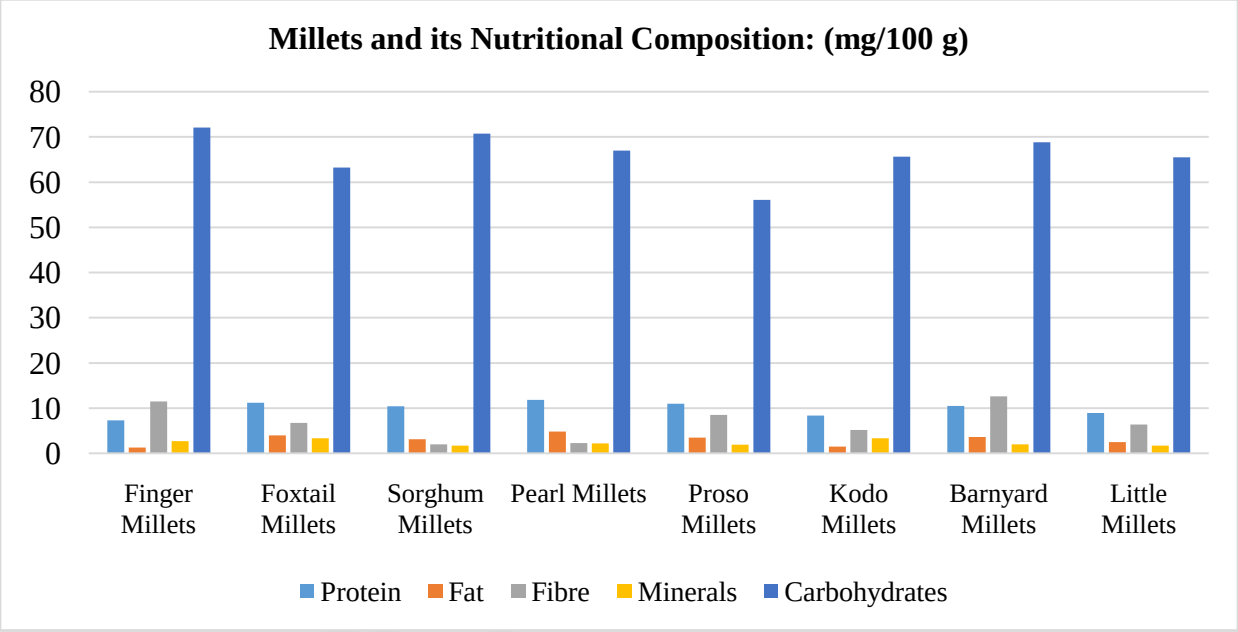
Millets	Common Name	Scientific Name
Finger Millets	Ragi	*Eleusine coracana*
Foxtail Millets	*Kangni*	*Setaria italica*
Sorghum Millets	*Jowar*	*Sorghum bicolor*
Pearl Millets	*Bajra*	*Pennisetum glaucum*
Proso Millets	*Chena*	*Panicum miliaceum*
Kodo Millets	*Kodon*	*Paspalum scrobiculatum*
Barnyard Millets	*Sanwa*	*Echinochloa crusgalli*
Little Millets	*Kutki*	*Panicum sumatrense*

Table 2 Millets and its Nutritional Composition: (mg/100 g)

Millets	Protein	Fat	Fibre	Minerals	Carbohydrates	References
Finger Millets	7.3	1.3	11.5	2.7	72.05	Himanshu *et al*. 2018.
Foxtail Millets	11.2	4.0	6.7	3.3	63.2	Jaybhaye *et al*. 2014.
Sorghum Millets	10.4	3.1	2.0	1.68	70.7	Tiwari *et al*.2023

Pearl Millets	11.8	4.8	2.3	2.2	67.0	Saini *et al*. 2021.
Proso Millets	11.0	3.5	8.5	1.9	56.1	Das *et al*. 2019.
Kodo Millets	8.35	1.5	5.2	3.3	65.6	Bunkar *et al*. 2021.
Barnyard Millets	10.5	3.6	12.6	2.0	68.8	Ugare *et al*. 2011.
Little Millets	8.92	2.5	6.39	1.72	65.5	Rao *et al*. 2017.

Fig. 1 Millets and its Nutritional Composition: (mg/100 g)



Finger Millets

Ragi, commonly known as finger millets, is a crucial staple food for people from low socio economic backgrounds and those who suffer from metabolic illnesses like diabetes and obesity. Rice or wheat can be substituted with finger millet, which is regarded as a healthy, nutritious food. They are a good source of minerals, dietary fibre, protein, and carbs. (Mathanghi and Sudha 2012). Its great ability to store food and nutritional value make it important. (Shashi *et al*., 2007).

It is a good laxative and helps to avoid constipation because of its high fibre content. It contains a lot of calcium, finger millet is beneficial for young children, the elderly and pregnant women. Additionally, it is highly beneficial for nursing mothers as it helps in the production of adequate breast milk (Ambati and Sucharitha 2019).

Foxtail Millets

Foxtail millet is a generally farmed and consumed cereal that is important to the worldwide economy, particularly in India, China, and other areas of Asia, North Africa, and the Americas.

It is a cereal grain that is a member of the Setaria genus and the Panicoideae subfamily of the Poaceae family (Sharma and Niranjan, 2018). The synthesis of the neurotransmitter acetylcholine, which transmits signals between muscles and nerves, is aided by foxtail millet's gluten-free, high protein, low carbohydrate composition. Foxtail millet keeps up the stamina, keeps you stronger, and increases immunity to combat numerous diseases that may be lurking because it is a nutritional powerhouse.

Sorghum Millets

Sorghum is one of the most significant crops in terms of cultivated land and global production. Sorghum is a grain that is both gluten-free and rich in nutrients and chemical compounds that have physiological effects. The fifth-largest cereal crop in the world, sorghum is widely grown as a grain, sweet, forage, low-lignin, and biomass crop. It can grow in a variety of climates. It is a crop that can be grown in arid environments since it is heat- and drought-tolerant. (Ratnavathi and Komala, 2016).Sorghum includes iron, calcium, fibre, protein, and wax policosanols, all of which have health advantages, including lowering cholesterol levels (O.S.K. Reddy 2017). Sorghum's abundance of tannins and polyphenols provides both anticancer and antimutagenic effects (Awika and Rooney 2004).

Pearl Millets

Pearl millet is a resistant cereal crop compared to wheat and rice, is cultivated in places with deficient rainfall. It is the sixth-most important grain in the world, and semiarid parts of Asia and Africa mostly depend on it for food (Upadhyaya *et al*., 2016).Pearl millet which accounts for 40% of worldwide production (Yang *et al*., 2012). Over 95% of pearl millets are produced in developing nations, with India producing the most with 9.8 million hectares worldwide (Rani *et al*., 2017). Pearl millet's high oil content (4–9%) allows for easy storage of the grain at low temperatures and low levels of moisture. Additionally, there are considerable amounts of unsaturated fatty acids, folate, copper, zinc, iron, magnesium, calcium, vitamin B complex, and other minerals (Saini *et al*., 2021).

Proso Millets

Proso millet is definitely a climate-smart, gluten-free, small-grain cereal that is good for both people and the environment. Protein and vitamins are found in proso millet. It is traditionally used as a restorative dish, particularly after childbirth or illness (Jana Kalinova, 2007).Niacin, a form of Vitamin B3, is what causes the Pellagra illness, which proso millet is helpful in treating. Niacin is highly concentrated in proso millet. Pellagra is a skin condition that results in dry, scaly, and rough skin (Prathyusha *et al*., 2021). Proso millet has a lot of benefits when used as human food. Proso millet has various specific properties (such as drought tolerance and a short growth season) that make it a suitable rotational crop for dry land farming systems based on winter wheat. When employed in a two-year wheat/summer fallow cropping system, proso millet offers the most economically advantageous production strategy. (Das *et al*., 2019).

Kodo Millets

Kodo millet has been suggested that it originally originated in India. Kodo millet is considered to have first been domesticated around 3000 years ago (Arendt and Dal, 2011). A traditional food that promotes weight loss and has a taste akin to rice is kodo millet. It is easily absorbed and abundant in phytochemicals and antioxidants, which help to prevent a number of diseases associated with a sedentary lifestyle (Ambati and Sucharitha 2019). Kodo millet can be consumed regularly by postmenopausal women who exhibit symptoms of cardiovascular disease, such as high blood pressure and excessive cholesterol. It has higher antioxidants, which guard against oxidative stress and maintain stable blood sugar levels and diabetes. Asthma, migraines, high blood pressure, heart attacks, atherosclerosis, and diabetic heart disease can all be treated with kodo millet. (Bunkar *et al*., 2021).

Barnyard Millets

In warm, temperate areas all around the world, the ancient millet crop known as barnyard millet (Echinochloa species) is grown. In Asia, especially in India, China, Japan, and Korea, it is extremely popular (Madhusudhana *et al*., 2018). It is the fourth most widely grown minor millet and provides food security to many poor individuals worldwide (Renganathan et al., 2020).Although it is also fed to animals, most barnyard millet is grown for human consumption. Echinochloa frumentacea (Indian barnyard millet) and Echinochloa esculenta (Japanese barnyard millet), which are both cultivated and wild species, are two of the most popular types of barnyard

millet (Sood *et al*., 2015). Barnyard millet is a short-lived crop that can tolerate a variety of biotic and abiotic stresses and grow in unfavorable environmental circumstances with essentially little input.

Little Millets

Little millet is a unique minor cereal that is grown extensively in the tropics and is a staple diet for some low-income groups around the world. Little millet provides a comparable source of protein, fat, carbohydrates, and crude fibre to other cereals like rice and wheat, and it also offers minerals and vitamins. It also includes phytochemicals including flavonoids, phytate, phenolic acids, and tannins (Pradeep *et al*., 2011). Little millet may be less nutrient-rich than other grains despite its small size. It has significant amounts of B vitamins as well as many minerals, including as calcium, iron, zinc, and potassium. This also gives the body the kinds of essential fats that promote weight loss. It also has the benefit of having a high fibre content, which makes it an excellent alternative to rice in Pongal or even Kheer (O.S.K.Reddy, 2017).

Fig.2 Different Types of Millets:

Sources: Tiwari *et al*., 2023

Health Benefits of Millets:

Millets have a number of nutritional advantages that can help people stay healthy, including lowering blood pressure, decreasing the risk of heart disease, preventing cancer and

cardiovascular diseases, and decreasing the occurrence of tumours, among other things. Increasing the time it takes for the stomach to empty and providing the intestines with some roughage are two additional health benefits (Sarita *et al.*, 2016). An alkaline-forming food is millet. To attain optimal health, meaning when it interacts with digestive enzymes, an alkaline-based diet is frequently advised. The calming alkaline properties of millet aid in preserving the body's optimal pH balance, which is essential to ward off infections (Vishakha *et al*., 2016). In many African and Asian nations, millets which are high in phytic content and minerals-are a staple food of all the grains, millet has the cheapest agricultural production costs (Hasan *et al*., 2021).

Saleh *et al*., (2013) studied the processing, nutritional value, and potential health advantages of millet grains. The bioavailability of micronutrients is improved by processed food. They are both very nutritious and include many elements that are good for human health. Postmenopausal women usually suffer from symptoms of cardiovascular disease, such as increased blood pressure and cholesterol levels. Therefore, including Kodo millet in a person's regular diet is quite beneficial for maintaining great health (Chandrasekara and Shahidi 2010).
The high protein content of millet supports children's healthy growth and development. Millet's level of calcium stimulates the development of bones and lowers the risk of bone fractures. Additionally, it has high-quality iron, which helps with anemia treatment. Millet's gluten-free status benefits those with celiac disease and, consequently, those who are gluten sensitive. (Prathyusha *et al*., 2021).

Although millets should be a regular part of our diet due to their many nutritious advantages, the majority of informed people have never ever heard of millets or their advantages. Foods devoid of fibre are causing serious health problems for people all over the world. By incorporating millets into a person's normal diet and avoiding refined foods like rice, wheat, processed meats, refined flours, refined oils, and ready-to-eat foods, all lifestyle diseases can be eradicated, according to prior research findings (Prathyusha *et al*., 2021).Millets are high in phenolic acids, phytates, and tannins, which are antinutrients that lower the incidence of colon and breast cancer. Millets can lower blood sugar levels by enzymatically hydrolyzing complex carbohydrates in hyperglycemia. The aldose reductase enzyme benefits in reducing sorbitol formation and lowers the chance of developing diabetes (Mishra *et al*., 2002).

Magnesium, which lowers the risk of heart attack, is abundant in millets. A good source of phytochemicals that lower cholesterol and help prevent heart disease is millets (Sarita and Singh 2016).

Fibre is present in millet, which promotes healthy digestion and helps to control bowel habits. Additionally, it possesses prebiotic qualities that aid in the development of probiotic bacteria in the micro biome by enhancing immune function all around and digestion, this has positive health effects (Kumar *et al*., 2023).

Conclusion:

Consumers are now easily drawn to fast food and bakeries, which has led to a lot of health problems. Therefore, the current study aims to emphasize the value of healthy food and encourage people to adopt millets as a healthy, nourishing food into their regular diet. The use of millets, an old treasured grain-like seed, in our daily diet has numerous health benefits. Most civilized people have never even heard of millet, much less are aware of its nutritional advantages. However, one of our distant ancestors' best-kept secrets was millet. Therefore, it can be said that people need to know about millets and their health advantages and consume millets to lead a healthy and happy life.

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