Millets: The Future Food for Humans

Dr Samarpana Shukla

Assistant Professor
Home Science
Career Convent Girls Degree College

***Abstract*- Millets, a minor cereal crop in the Poceaea genus, are tolerant to drought and may thrive in a variety of climatic situations. They are gluten-free and high in protein, which is crucial. They are a rich source of phytochemicals that have anti-inflammatory and antioxidant effects, which reduce the risk of many diseases. Many African and Asian nations rely on millets as a staple food to provide food security for their populations. Sorghum, pearl, and finger millet are under the major millets category, whereas proso, barnyard, kodo, tiny, and foxtail millets are classified as minor millets. The many types of millets, their global production, their nutritional makeup, and their bioactive substances are the main topics of this review. The article discusses the nutritional value of millets and urges further investigation into the health benefits and practical uses of different millet kinds. Millet, sorghum, finger, pearl, kodo, proso, foxtail, barnyard, and worldwide millet production are some of the terms and related schemes have been discussed.**

Keywords: **Millet, Sarghum, Peared millet, and Finger millet, health benefits, millet production.**

INTRODUCTION:

Millets are referred to as "yesterday's coarse grains and today's nutri-cereals." Millets are regarded as "future crops" since they are able to thrive in hard environments and are resistant to most pests and illnesses. Small-seeded grains known as millets have been grown for thousands of years in many regions of the world. With a high fibre content and an abundance of vitamins, minerals, and proteins, they are an excellent source of nutrition. They are suitable for people with celiac disease or other gluten sensitivities because they are gluten-free. Millets can be consumed whole and prepared as porridge or processed into flour and used to make pasta, bread, and cake. After decades of negligence, nutri-cereals are making a strong comeback in the Indian cereal's production segment. India dominates the global production of millets with a total share of about 40.62% and an estimated production of about 10.91 million tonnes during 2018–2019 (Ashoka P., Gangaiah B., Sunitha N. 2020). India ranks first in nutri-rich millet production and second in rice and pulses across the globe, it also—unfortunately—ranks second in child malnutrition incidences. India is home to more than one-third of the world's malnourished children (Nainwal K. 2018). By contrast, the country has also become a hub for diabetic and overweight populace, putting the country under a double burden of malnutrition (Dutta M., Selvamani Y., Singh P., Prashad L. 2019).

Over half a billion people in Asia and Africa consume millets, which are farmed in more than 130 countries. Millets have long been regarded as an essential component of their diet. Millets were one of the first crops to be domesticated in India. Millets provide a number of health advantages in addition to being environmentally friendly due to their minimal water and input requirements. The Government of India (GoI) has prioritised millets due to their immense potential to create livelihoods, boost farmer income, and guarantee food & nutritional security worldwide. In order to increase marketing and demand generation, millets were rebranded as "Nutri Cereals" in April 2018, and 2018 was subsequently named the National Year of Millets.

On March 5, 2021, the United Nations adopted a resolution designating the year 2023 as the International Year of Millets, with support from 72 nations. Giving the human race's traditional wisdom such honour is crucial. These are the original cultivated food plants. In order to kick off the International Year of Millets (IYM) 2023, the Food and Agriculture Organisation (FAO) of the United Nations held an inauguration ceremony in Rome, Italy, on December 6, 2022. There is proof that millets were grown on the Korean peninsula around 3500 B.C. Yajurveda Texts in India make reference of millets. Till about fifty years ago, millet was widely grown. But India has neglected its traditional knowledge as a result of the Western growth model. Millets are criticised as being overly basic and coarse. It was exclusively considered to be the diet of farmers or ancestors.

"Zero hunger" is the goal number two in the Sustainable Development Agenda. One of the UN's 17 Sustainable Development Goals, it was adopted in 2015. "End hunger, achieve food security, improve nutrition, and advance sustainable agriculture," is the phrase used in the official statement.To feed the 800 million people on the planet today, a significant transformation in the food and agricultural systems is required. By concentrating on millet production, it might be feasible. Around 40% of the earth's land surface is dryland. The best crop for dryland agriculture is millets.

These Nutri cereals are annual, short-duration (75–120 days), rainfed crops that thrive in shallow, poor fertility soils with a pH range from acidic to alkaline. It can be cultivated in conditions with little rainfall and high temperatures because it requires little water. These require the least amount of maintenance and are drought-resistant, disease- and pest-resistant. These are C4 plants that have a higher photosynthetic efficiency than C3 plants at converting CO_2 into sugars.

MILLETS FOOD: THE TRADITION OF INDIA

The Latin word milum, which signifies grain, is where the word "millet" first appeared. The Poaceae family, also referred to as the grass family, includes a variety of cereals known as millet. Millet comes in a variety of varieties that vary in colour, texture, appearance, grain size, and species. These are divided into two categories based on the size of the grain: Large or major millets and Small or minor millets.

- **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 is the largest producer of millet as of 2021, with a total Share of 41% followed by Niger (12%) and china (8 %) India also ranks 12th among those countries that produce high yields of millet. Millets have integral part of our diet for centuries .With the aim to create awareness & increase production and consumption of millets , the United Nations at the behest of the government of India, declared 2023 as the "International Year of the Millet .

Jowar and Bajra are grown in the majority of Indian states, with the exception of the North Eastern states of Himachal Pradesh and Jammu and Kashmir, which include Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh, and Tamil Nadu. Both varieties are available for cultivation as Kharif (July-November) and Rabi (October-February) crops. There are conventional cultivars of these crops available in India. They show numerous variations in both duration and quality. They can be produced as standalone plants, as intercrops, and as mixtures. The crop lasts between 90 and 120 days. It is possible to grow Jowar-Arhar and Jowar alongside other pulses, as well as Bajra and other grains. The soil fertility is increased by using a mung and jowar crop rotation. Bajra can be produced alongside other crops.

Millets are also raised under irrigation. Millets can be grown with just one to two plowings. For sowing, the seed rate varies from millet to millet. These crops can be grown with 3–4 rains. Seed drills or dribbling are used for the sowing. Small quantities of phosphatic or nitrogenous fertilizers are needed. For pesticides, there is a minimal standard or none at all. The stem and leaves of the panicles are used as animal feed, and the panicles themselves contain grains.

Millets or traditional Indian course grains, are good for so many reasons that it seems a bit too good to be true. Obesity diabetes nutrition, water conservation and air pollution are just some awareness already about the health benefits of millets. There is quite some awareness already about the health benefits of millets. They have a considerably lower glycemic index than refined white flour and rice.

NUTRIENT COMPOSITION OF MILLETS

India's major millet include Sarghum, Peared millet, and Finger millet, which are more commonly Known as Jowar , Bajra , and Ragi respectively . They are a natural Source of iron, zinc, calcium and other nutrients. And have higher Content of folic acid, calcium, iron potassium, magnesium and zinc. Finger millet being the richest source of calcium (300-370 mg/100g).

Millets are rich in dietary fibre and nutrients. They are a good source of protein, phytochemicals, and minerals. The millets are high in dietary fibre, 7–12% protein, 2-5% fat, and 6–75% carbs. Compared to other grains like maize, millet protein has a better essential amino acid composition. Less cross-linked prolamins are found in millet, which may be another role in millet's improved protein digestibility.

Similar to cereal proteins, millet proteins are weak sources of lysine; nevertheless, they pair well with lysine-rich vegetables (leguminous) and animal proteins to create composites with high biological value that are nutritionally balanced. When compared to fine cereals, millets are more nutrient-dense. Small millets are a good source of iron and phosphorus. With phytates, polyphenols, tannins, anthocyanins, phytosterols, and pinacosanols present, millets have a significant role in ageing and metabolic illnesses and contribute to antioxidant activity. All types of millets have significant antioxidant capacities.

Significance of Millets:

A common grain, millets are high in phytic content and micronutrients. diet in numerous Asian and African nations. The least expensive crop to produce agriculturally is millet (Hasan et al. 2021). Previous studies on millets' medicinal potential have demonstrated the nutritional benefits of their antioxidant activity. Millets have bioactive compounds that may reduce the risk of a number of diseases, such as cancer, diabetes, high blood pressure, and cardiovascular disease (Sharma et al., 2021). In addition to their nutritional advantages, millets include antioxidants such phenols, tannins, and flavanoids (Liang and Liang, 2019). Millets may improve postprandial hyperglycemia by decreasing carbohydrate complexes by enzymatic hydrolysis, -glucosidase, and pancreatic amylase levels. Furthermore, millets may lessen Type 2 diabetes because of the magnesium they contain.

Numerous millet whole grains, including the kodo, finger, foxtail, proso, pearl, and small millets, have been discovered to have soluble- and insoluble-bound phenolic extracts that are high in phenolic compounds and possess antioxidant, metal chelating, and reducing capabilities. (Saleh, et.al.,2013). The whole grain of millet has prebiotic action, which increases the population of friendly bacteria, which is essential for digestion, and is a natural probiotic therapy for diarrhoea in young children (Sarita and Singh, 2016). Millet-eating cultures had an epidemiologically lower incidence of diabetes, and eating whole-grain meals has been recommended for avoiding and treating diabetes mellitus (Saleh et al., 2013). When someone with a genetic sensitivity consumes gluten, it can result in an immune-mediated enteropathy called celiac disease.

Millets are a great option for those who are gluten-sensitive and/or have celiac disease because they are gluten-free (Sarita and Singh, 2016). However, it has been demonstrated that phytates, phenols, and tannins may all contribute to antioxidant activity, which is significant in health, ageing, and metabolic syndrome (Saleh et al., 2013). Millet grains are strong in antioxidants and phenolics. Millet has a history of creating a variety of healthful food items as a foundational ingredient and other essential ingredients (Yousaf et al., 2021). Barnyard millet is a great option for commercial diabetes, infant, and pregnant women diets due to its high iron concentration. In the Himalayan region, barnyard millet is a significant source of animal feed. Barnyard millet has broad leaves, develops quickly, and yields a lot of feed (Sood et al., 2015).

MAJOR "MILLETS" AND ITS HEALTH BENEFITS –

Millet is one of the oldest cultivated gains in the world and has been grown throughout Africa and Southeast Asia for thousands of years. Millet can be used to make bread, beer, cereal and other dishes. Even today, millet is a staple food around the world.

Millet is rich in than niacin, which helps your body manage more than 400 enzyme reactions. Niacin is also important for healthy skin and organ function. Infact, it's such an important compound that its often added to processed foods to in rich them.
Millet, especially the darker varieties, is also an excellent source of beta – carotene. This natural pigment acts as both an antioxidant and as a precursor to vitamin A, helping body fight off free radicals and supporting the health of eyes. Some major millets health benefits are as follows:
Jowar- It is gluten free and good source of protein. It is a great food for Diabetic patients.
Bajra - Vitamin B6, folic acid is present in it. It removes Anemia.
Ragi - It is a Source of natural calcium . Helps in Strengthening bones of growing children and elders.
Sama - Rich in fiber & iron. Removes Acidity, Constipation and Anemia.
Kodo- It is also rich in fiber Beneficial in diseases related to Goitre , Rusacea and Piles .
Kutki – It is a good source of antioxidants. The magnesium present in it controls healthy heart & Cholesterol.
Kuttu- It is beneficial for Asthma Patients. The amino acid present in it prevents hair loss

MEASURES TO INCREASE MILLET PRODUCTION

Recently, millets have gained attention and efforts are underway to obtain their convenient andvalve added processed products . It has been now proposed to enlarge the food basket and include millets like jowar,bajra,ragi etc. in the Public Distribution System.

Government has recognized the role of millets In the food chain. Under the National Food Security Mission NFSM of the preliminary targets for enhancing food grain production by an additional 25 Million tones , the Share allocated for millets is 25 Million Tones i.e. 8% of the enhanced food grain production .

The Indian policymakers refocused their attention towards millet farming systems and enacted Systems and enacted policies to create enabling environment of the farmers, with respect to millets production, some of the existing Schemes by the Government of India include: -
1- Integrated Cereal Development Programmes in Coarse Cereals ICDP - CC based Cropping Systems areas under Macro Management of agriculture - MMA
2- Initiative for Nutritional Security through Intensive Millets Promotion - INSIMP a part of Rashtriya Krishi Vikas Yojana, - RKVY which is only comprehensive initiative to Support millet production.
3- Rainfed Area Development Programme- RADP – a component of the Rashtriya Krishi Vikas Yojana- RKVY.
Some of the advantages of production of Millets in India-
1- Millets are termed as the "miracle grains" or crops of the future, as they can not only grow under harsh cucumstances but , are drought resistant Crops that require fewer external inputs.
2- Millets are dual purpose crops .It is cultivated both as food and fooder thus providing food , livelihood security to millions of households and contributing to the economic efficiency of farming.
3- Millets contribute to mitigating climate change as it helps reduce the atmospheric Carbon pressure Co_2 On the contrary, wheat being a thermally sensitive crop and paddy is a major contributor to climate change through methane emission.
4. Production of millets does not depend on the use of Chemical fertilizers The millet crops do not attract pests and are not affected by storage.
5- Millets are remarkable in their nutritive value be it vitamins, minerals, dietary fibers or other nutrients. It is near 3 to5 times nutritionally superior to wheat and rice. Sorghum (Jowar) is an important source of polyphenols, antioxidants, and cholesterol lowering waxes.
6-Millets help incurbing, obesity lowers the risk of hypertension, CVDs , T2DM, cancers as well as
helps in preventing constipation due to their heigh dietary fibre Content Coupled with law glycemic index.

CONCLUSION:

The most recent study on millet grain production, nutritional value, and significance is presented in this article. According to the findings of the study, millets are regarded as a staple meal in many African and Asian nations because they are abundant in macro- and micronutrients, and their mineral and essential amino acid levels are higher than those of wheat and rice. Millets contain bioactive substances that may help prevent or treat a number of illnesses, including cancer, diabetes, high blood pressure, and cardiovascular disease.
Due to their gluten-free and celiac qualities, millets are also replacing major cereals, offering patients and the health-conscious populace a better option. They might be utilised to increase their nutritious content through bio-fortification. To learn more about millets and their qualities, basic study is needed in the future. A change in consumer preference from main cereals to minor cereals for a sustainable food supply and nutritional security is needed for future millet research and development.

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