Vol. XI, Issue I, Nov 2023

ANKUR

Department of Botany, Bioinformatics and Climate Change Impacts Management,

School of Sciences

Gujarat University

Ahmedabad-380009, Gujarat

India

ANKUR

VOLUME XI ISSUE I Nov 20

ANKUR

……Sprouting of thoughts

Ankur is symbol of new beginning towards growth. And Ankur is here to introduce budding writers. It would represent interesting articles in Botany, Bioinformatics and Climate Change Impacts Management. Each seed has the innate potential to grow - blossom, and display its magnificence after its dormancy has been broken. Same way this Newsletter would provide a platform to young researchers to share news and views, promote awareness about the subjects and generate interest in related issues. Ankur would be taken care of by a team of dedicated Student Editors who would select and edit articles for online publication.

We wish Team Ankur all the best for this endeavour.

FROM EDITOR'S DESK….

Ankur is now eight years old. This newsletter is intended to be published twice in a year. The growth and development of Ankur is a reflection of the growth and progress of the students of the Department. This newsletter will serve to reinforce and allow increased awareness, improved interaction and integration among all of us. ***The journey began seven years ago and now Ankur has blossomed and is spreading the fragrance to everyone around with the message that plants are significant and valuable.***

In this issue, we focus on Millets.

PATRON'S MESSAGE

Millets as a Path to a Sustainable Future

In today's world of processed foods and monoculture crops, millets—small, ancient grains—are making a strong comeback. Once a staple in many cultures, millets offer a wealth of health benefits and environmental advantages that make them the perfect choice for the future.

Nutritionally, millets are rich in protein, fiber, and essential minerals like calcium, magnesium, and iron. They have a low glycemic index, making them ideal for managing blood sugar levels, and are gluten-free, offering a healthy alternative for those with dietary restrictions. Their high fiber content also aids digestion and promotes overall gut health.

Environmentally, millets are a game-changer. They are drought-resistant, require minimal water, and can grow in poor soil, making them an ideal crop for regions facing climate stress. Millets also reduce the need for chemical fertilizers, supporting sustainable farming practices and healthier ecosystems.

As people increasingly seek sustainable, nutrient-dense foods, millets are gaining popularity. Reviving this ancient grain can help us address modern-day challenges like food security, climate change, and rising health concerns. By choosing millets, we embrace a food that not only nourishes our bodies but also protects our planet.

Let's make millets a part of our daily diet and support a more sustainable, healthier future for all.

This issue of Ankur focuses on **Millets** and shares the expanse of knowledge in this global priority.

Dr. Hitesh Solanki
Patron-GUBS
Professor & Head,
Department of Botany, Bioinformatics
& Climate Change Impacts Management
Gujarat University
Ahmedabad 380 009

MILLETS: THE NATURAL SUPERFOOD FOR A SUSTAINABLE FUTURE

Prof. Dr. Hiteshkumar Solanki

In a world where modern food systems are often dominated by monocrops and processed convenience foods, the humble millet stands as a beacon of nutritional richness, environmental sustainability, and cultural heritage. Once a staple in many parts of the world, millets have now emerged as a superfood of sorts, attracting attention from nutritionists, environmentalists, and food enthusiasts alike. But the story of millets is not just about food—it is about reconnecting with nature, reviving ancient agricultural practices, and ensuring a sustainable future for our planet and its people.

A Nutritional Powerhouse: Millets, a group of small-seeded grains from the grass family, come in a variety of types such as pearl millet, finger millet, foxtail millet, and sorghum. These grains have been consumed for thousands of years in different parts of the world, particularly in Asia and Africa, for their excellent nutritional profile. They are naturally rich in dietary fiber, antioxidants, essential minerals like calcium, magnesium, and iron, and are a good source of plant-based protein. In a world where chronic diseases such as obesity, diabetes, and heart disease are on the rise, millets provide a much-needed alternative to the refined carbohydrates and sugars that dominate modern diets.

Millets in India

One of the standout features of millets is their low glycemic index (GI), meaning they have a slower impact on blood sugar levels. This makes them an ideal food for individuals with diabetes or those looking to maintain a balanced energy level throughout the day. Their high fiber content aids digestion, prevents constipation, and helps maintain a healthy gut microbiome. Millets are also gluten-free, making them an excellent choice for people with celiac disease or gluten intolerance.

Millets are hardy crops that thrive in dry, arid conditions and require minimal water compared to rice or wheat. They are drought-resistant, making them an ideal crop for regions facing water scarcity, especially in areas prone to climate shocks.

Culinary creativity around millets is also booming. Millets can be used in a wide range of dishes, from traditional meals to modern fusion cuisine. Whether in soups, salads, desserts, or as an alternative to rice or pasta, millets offer a flavorful, nutritious, and satisfying base for countless recipes. This adaptability in the kitchen makes millets a great choice for anyone looking to diversify their diet and reduce reliance on processed foods.

Millets offer us a chance to reconnect with nature and embrace a food system that prioritizes health, sustainability, and resilience. By choosing millets, we not only support our own well-being but also contribute to a more sustainable and equitable global food system. As we continue to navigate the challenges of climate change and environmental degradation, the natural, low-input, and highly nutritious millet could play a crucial role in feeding the world while preserving the planet for future generations.

It's time to rediscover millets—not just as an ancient food, but as the natural food of the future. Let’s give these tiny grains the recognition they deserve and incorporate them into our daily lives, for a healthier, more sustainable world.

Reference:

Ragaee, S. et al. (2012). *Nutritional Quality of Millets and Their Potential for Health Benefits. Food Research International, 49*(1), 214-227.
Ghosh, S. (2017). *Millets: The Superfood of the Future. Environmental Science and Pollution Research, 24*(19), 15680-15692.
Haug, W. et al. (2020). *Millets and Their Role in Sustainable Food Systems. Food Security, 12*(2), 409-422.
Sharma, S., & Bhat, R. (2015). *Millets as an Alternative Cereal Grain for Gluten-Free Diets: A Review. Critical Reviews in Food Science and Nutrition, 55*(5), 668-675.
FAO (2018). *The Role of Millets in Global Food Security. Food and Agriculture Organization of the United Nations.*
Rao, S. & Laxmi, S. (2016). *Millets for Better Health: A Global Perspective. Journal of Cereal Science, 71*, 1-8.
Image Courtesy:

https://prakati.in/millets-the-superfood-of-india-what-types/

ENVIRONMENTAL SUSTAINABILITY: MILLETS FOR A CHANGING CLIMATE

Prof. Dr. Himanshu Pandya

As climate change continues to disrupt agricultural systems and threaten global food security, the need for sustainable and resilient crops is more pressing than ever. Here, millets offer an essential solution. Unlike crops like rice and wheat, which are highly water-intensive and vulnerable to changes in weather patterns, millets thrive in harsh, arid conditions. They are drought-resistant, requiring far less water to grow, making them an ideal crop for regions facing water scarcity, especially in places prone to droughts or erratic rainfall patterns.

Furthermore, millets can grow in poor soil conditions where other crops may struggle. This reduces the need for chemical fertilizers and pesticides, promoting the health of the soil and surrounding ecosystems. By cultivating millets, farmers can help restore biodiversity and maintain sustainable farming practices without relying on harmful agrochemicals. This makes millet cultivation an environmentally friendly choice, with less impact on ecosystems and fewer greenhouse gas emissions compared to conventional farming practices.

Millets also have a shorter growing season than many staple crops, such as rice, meaning they are less susceptible to the vagaries of climate change. They require fewer inputs, making them an economically viable crop for smallholder farmers, particularly in developing countries where resources may be limited. By adopting millets, farmers can diversify their crop production, reducing dependency on a single crop and strengthening their resilience against environmental and economic challenges.

Image: https://timesofindia.indiatimes.com/the-seed-of-an-idea-how-millets-can-help-mitigate-climate-impacts-on-food/articleshow/94405809.cms

Reference:

FAO (2018). *The Role of Millets in Global Food Security and Climate Change Adaptation. Food and Agriculture Organization of the United Nations.*

Rao, S., & Laxmi, S. (2016). *Millets for Better Health and Environment: A Review. Critical Reviews in Food Science and Nutrition, 55*(5), 668-675.

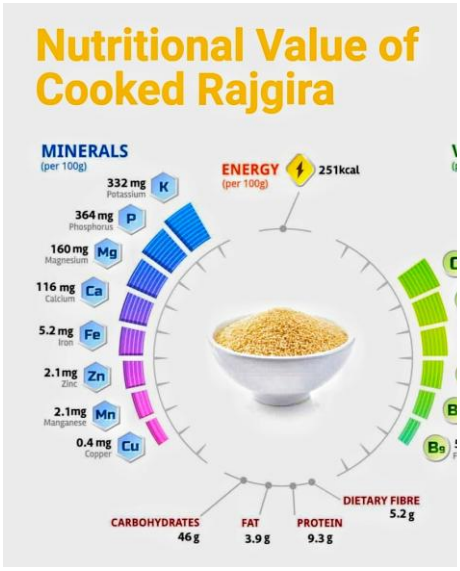
THE MILLETS: *AMARANTHUS PANICULATUS* SENSU HOOK F

(**Royal Grain - Ramdana - Kingseed - Rajgaro**)

Prof. Dr. Bharat Maitreya

Family: AMARANTHACEAE

Amaranthus paniculatus sensu



The year 2023 has been declared as the International Year of Millet by the United Nations. Mostly the Government of India, other State governments as well as most of Educational, Research and Training Institutions in addition to medical education, Ayurveda, Homeopathy, Naturopathy and Food and Nutrition Science, each of these departments related to the health welfare and services following action for Dillet Missions.The plant and its various parts used as food in daily life as millets are declared as the international food of Millets.

In this, efforts have been made to spread awareness about nutritious dishes and dishes made from millet or to make its health benefits available to maximum people in the form of various dishes in daily life.Wheat, rice, millet, corn, sorghum, ragi, nagli, moraiyo , rajgara, etc., and especially from plants of the Poaceae (dhanya) family, the structure of the fruit seeds or the grain can generally be used to obtain nutritional elements related to health.

We can get information from people and it is mostly urban and there is an urgent need to spread it in such a way that it is consumed in large quantities. Today, many types of millet are known for their nutritional information. Many government agencies as well as private NGOs, Universities and schools are currently starting of awareness campaign. If we talk about millets. In general, millets known as finger millet, pal millet are found in it. If we extract some of its properties about millet, then generally, Ragi has three times the calcium of milk, pal millet has six times the calcium of rice. Wheat contains three times more dietary fiber than rice and corn. It contains more zinc and folic acid. It has a high number of antioxidants and minerals. Its glycemic index is very low. It can be very helpful in kidney, liver and immune system which are related to our health and it is the work of reducing bad cholesterol level. This may help. Information about minute and minute can

increase the household conservation that we usually have. Millet's food culture can be used in urban and rural areas. It is for the conservation and promotion of millets and its system. It is usually grown in a specific area or geographical area according to the soil condition and weather. Then we can add that product as a crop system as an improvising, especially above the post-harvest and primary processing enterprise. We can take care of agricultural products. Generally, there are many parts in millet, according to which the welfare hostels or more nutritional schemes that are running at the school level should be added to it for the future generation. From the school level to the College youth, should be informed about it use as food and to increase the Mental health benefits, their body and muscle strength, and built immunity against some pathogenic diseases. Educational institution should take responsibility for using these millets in our daily meals.

Amaranthus paniculatus, contains many nutrients, including:**Protein**: A high quality protein that is high in lysine, an amino acid that is low in other grains .**Fiber**: A good source of fiber **Minerals**: Contains calcium, iron, magnesium, potassium, and zinc **Vitamins**: Contains vitamins A, K, B6, C, and E **Squalene**: A natural source of squalene, an antioxidant that may help with cancer, hypercholesterolemia, and cardioprotection

- **Antioxidant metabolites**: Contains betacyanin (amaranthine), ascorbic acid, soluble monosaccharides, disaccharides, and organic acids .Some of the benefits of rajgara, including an excellent source of calcium, iron, magnesium, potassium and folic acid, are known to increase energy as well as contain protein and zinc.These millets contain carbohydrates, proteins, fats, energy, fibers, minerals, calcium, potassium, magnesium, sodium, potassium, copper, manganese, molybdenum, zinc, chromium, ferus, chloride, in addition to vitamin A, vitamin B6, folic acid, vitamin B5, and vitamin E, they are also found in higher amounts than others.

Amaranthus paniculatus is a pseudo cereal that is gluten-free and can be used as a nutritious ingredient in gluten-free formulations.Indians are mostly used these seeds and its flour items during Fasting.

References:

1. Pastor K, Akanski M. The chemistry behind amaranth grains. J. Nutr. Health Food Eng,2018:8(5):358-360. doi: 10.15406/jnhfe.2018.08.00295
2. Renu Singhal1 , Garima Modi2*, Manisha Choudhary3 , Monika Chamoli4 , Sulochana Sharma5 , Raaz K Maheshwari6 International Journal of Multidisciplinary Research and Development www.allsubjectjournal.com . Volume 9, Issue 1, 2022, Page No. 14-18
3. Vora JD, Jadhav P, Rane A. Biochemical, Anti-Microbial and Organoleptic Studies on Rajgira (Amaranthus Caudatus). IOSR J. Pharma. Biol. Sci,2014:9(2) Ver.VI:01-05.
4. Tikekar RV, Ludescher RD, Karwe MV. Processing Stability of Squalene in Amaranth and Antioxidant Potential of Amaranth Extract. J. Agricul. Food Chem,2008:56(22):10675-10678.

MILLETS -MOST PRECIOUS SUPER FOOD

Prof. Dr. Nainesh Modi

Millets are a diverse collection of small-seeded grasses that are farmed as cereal crops and grains all over the world. Millet can be white, gray, yellow, or red, and it is small and spherical (Mall, T. P *et al.,* 2016). In addition to being a major source of income, millet grains are crucial as food for low-income families to combat malnutrition. Indigenous knowledge is essential for diagnosing illnesses and providing medical care in traditional systems. Consuming foods high in gluten causes celiac disease, an immune-mediated enteropathy (Becker, F. S *et al.,* 2014). Consuming millet has several health benefits, mostly because of the bioactive phytochemicals such as lignins, flavonoids, phenolics, beta-glucan, sterols, inulin, pigments, dietary fibers, and phytate that are present in these cereals. Since millets are gluten-free, they can be used to treat those with celiac disease and gluten sensitivity (Annor, G. A *et al.,* 2017). Millets' polyphenols have inhibitory action against the enzymes malt amylase, aldose reductase of cataract eye lenses, and phospholipases found in snake venom (Sudha, K., *et al.,* 2017). It has been observed that the phenols in finger millet seed coat reduce hyperglycemia by inhibiting the activity of the enzymes α-amylase and α-glucosidase (Shobana, S *et al.,* 2014). According to Jnawali, Kumar, and Tanwar (2016), pearl millet has long been used to treat several non-communicable disorders, including constipation and celiac disease. The biological activity and potential uses of these compounds have been the subject of several investigations, which have led to a thorough examination of their pharmacodynamics and kinetics. To fully utilize their therapeutic potential in the fight against a variety of illnesses, including cataracts, gastrointestinal issues, and cardioprotection, proper standards and clinical trials are required.

Types of Millets

The millets commonly grown in India include

1. Bajra (Pearl millet)
2. Jowar (Sorghum)
3. Ragi (Finger millet)
4. Jhangora (Barnyard millet)
5. Barri (Common or Proso millet)
6. Kangni (Italian or Foxtail millet)
7. Kodra (Kodo Millet)

Usefulness of Millets:

- Millets are highly adaptive to a wide range of environmental conditions and they also thrive well in rain-fed; dry climates and require less water and fertilizers.
- Millets have a low Glycemic Index (GI) and are also associated to fight against diabetes.
- Millets are gluten-free and can be consumed by celiac disease patients.
- Compared to other cereals they have a superior micronutrient profile and bioactive flavonoids.
- They are good source of minerals like iron, zinc, and calcium.
- They are found to be helpful with the reduction of weight and BMI.

- 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.
- 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.

References

1. Mall, T. P., & Tripathi, S. C. (2016). Millets the nutrimental potent ethno-medicinal grasses: A review. *World J Pharm Res*, *5*(2), 495-520.
2. Becker, F. S., Damiani, C., de Melo, A. A. M., Borges, P. R. S., & de Barros Vilas Boas, E. V. (2014). Incorporation of buriti endocarp flour in gluten-free whole cookies as potential source of dietary fiber. *Plant Foods for Human Nutrition*, *69*, 344-350.
3. Annor, G. A., Tyl, C., Marcone, M., Ragaee, S., & Marti, A. (2017). Why do millets have slower starch and protein digestibility than other cereals?. *Trends in Food Science & Technology*, *66*, 73-83.
4. Sudha, K., & Mathanghi, S. K. (2012). Traditional underutilized green leafy vegetables and its curative properties.
5. Shobana, S., Sreerama, Y. N., & Malleshi, N. G. (2009). Composition and enzyme inhibitory properties of finger millet (Eleusine coracana L.) seed coat phenolics: Mode of inhibition of α-glucosidase and pancreatic amylase. *Food chemistry*, *115*(4), 1268-1273.
6. Nithiyanantham, S., Kalaiselvi, P., Mahomoodally, M. F., Zengin, G., Abirami, A., & Srinivasan, G. (2019). Nutritional and functional roles of millets—A review. *Journal of food biochemistry*, *43*(7), e12859.
7. https://apeda.gov.in/apedawebsite/SubHead_Products/Indian_Millets.htm

CONSERVATION OF MILLETS FOR FUTURE GENERATION

Mr. Hitesh Kumarkhaniya

Millets are a diverse group of small-seeded grains that have been cultivated majorly by local people. Many plant (crops) are included under the millets such as Pearl Millet (*Pennisetum glaucum*), Foxtail Millet (*Setaria italica*), Sorghum (*Sorghum bicolor*) and Finger Millet (*Eleusine coracana*). Now a days millets are gradually removed from our daily diet. So, its conservation is very important for future generation, because future generation not aware about the millet's diversity and their nutritional value. Some benefits are mention here,

- Nutritional Benefits: Millets are rich in fiber, vitamins, minerals, and antioxidants, offering a balanced diet.
- Climate Resilience: Their drought tolerance and ability to grow on marginal lands make them ideal for adapting to changing climate conditions.
- Biodiversity: Conserving millets helps preserve genetic diversity in agriculture, essential for future food security.
- Soil Health: Millets can improve soil health through their deep root systems and ability to fix nitrogen.

Conservation Strategies:

1. Seed Banks
2. On-Farm Conservation
3. Community-Based Conservation
4. Research and Development
5. Policy Supporting conservation

References:

1. King, E. I. O., Nambi, V. A., & Nagarajan, L. (2008, March). Integrated approaches in small millets conservation: a case from Kolli Hills, India. In *International Symposium on Underutilized Plants for Food Security, Nutrition, Income and Sustainable Development 806* (pp. 79-84).
2. Das, I. K., & Rakshit, S. (2016). Millets, their importance, and production constraints. In *Biotic stress resistance in millets* (pp. 3-19). Academic Press.

MILLETS: EMBRACING TRADITION TO CULTIVATE A HEALTHIER TOMORROW

Mr. Parth Desai

In the face of climate change, millets stand out as an ideal crop to combat hunger, poverty and nutritional deficiencies. Varieties such as Finger, Foxtail, Pearl, Little and Sorghum millets are not only rich in proteins, essential amino acids and dietary fiber but are also packed with vitamins, minerals and antioxidants, earning them the title of "nutraceuticals." Their health benefits include hypoglycemic, anti-tumorigenic and anti-inflammatory properties, while the presence of polyunsaturated fatty acids makes them heart healthy and gluten free, catering to those with celiac disease. Culturally significant in tribal communities, millets are enjoyed in various forms and their processing, particularly fermentation, enhances their nutritional value. Beyond nutrition, millets are vital for food security and livelihoods in Africa and Asia, making them a key player in promoting a sustainable agricultural future.

Here are few easy and delicious recipes to make our life healthier:

1. Ragi laddu: Fry 1 cup of ragi flour with 2 tablespoons of ghee until aromatic, then grind the cooled powder of dry roasted peanuts, coconut, almonds, and sesame seeds until the oil oozes out; afterward, add jaggery powder, mix everything evenly, and roll the mixture into Nachni laddos.

2. Foxtail millet dhokla: Dhokla is prepared by fermenting a batter made from a combination of foxtail millet and split black gram dal (urad dal). The process begins with soaking the millet and dal for 4-5 hours, followed by grinding them into a smooth batter. To facilitate fermentation, curd is added to the batter, which is then allowed to ferment for 7-8 hours. After fermentation, the batter is seasoned with salt, green chilies, and coriander powder before being steamed until fully cooked.

3. Brown top millet salad: Heat medium sesame oil in a large pan or wok, then sauté minced garlic and ginger for 1 to 2 minutes. Add 50 grams of tofu chunks and cook until they turn light brown. Next, stir-fry your choice of vegetables in the skillet for 3 to 4 minutes until they are crisp-tender. Combine the sautéed mixture with 1 cup of cooked brown top millet and soy sauce, stirring constantly for 2 to 3 minutes. Season with salt and pepper to taste, and serve the stir-fry hot, garnished with sesame seeds

References:

Saleem, S., Mushtaq, N. U., Shah, W. H., Rasool, A., Hakeem, K. R., Seth, C. S., ... & Rehman, R. U. (2023). Millets as smart future food with essential phytonutrients for promoting health. Journal of Food Composition and Analysis, 105669.

https://cookwithrenu.com/foxtail-millet-dhokla-steamed-millet-cake
https://twobrothersindiashop.com/blogs/food-health/brown-top-millet-benefits
https://www.indianhealthyrecipes.com/ragi-ladoo/

MILLET: THE SUSTAINABLE SUPERFOOD SHAPING 2023

Ms. Bhavyaben Radadiya

Millet is a type of grain that is popular in many parts of the world, especially in Africa and Asia. Year 2023 we celebrating the international year of millets. Millet is worldwide nutritional and demanding food to the people. Government of India had suggested to United Nations for declaring 2023 as international year of millets. The theme of the international year of millets is healthy millets, healthy people. Millets are an important source of nutrition and offer a range of health benefits. They are high in fiber, which helps promote digestion and lowers cholesterol. India is the world's largest producer of millet. According for 20% of the global production and 80% of Asia's production. Millet highlighting the nutritional value and climate-resistant nature of these small grains, aiming to raise awareness about their benefits and encourage increased consumption worldwide as a natural and sustainable food source; essentially making 2023 a year focused on promoting millets as a key part of a healthy diet.

(https://yenkasa.org/international-year-of-millets-2023-unleashing-the-potential-of-millets-for-the-well-being-of-people-and-the-environment)

References

1. Saleh, A. S., Zhang, Q., Chen, J., & Shen, Q. (2013). Millet grains: nutritional quality, processing, and potential health benefits. *Comprehensive reviews in food science and food safety*, *12*(3), 281-295.
2. Banerjee, P., Maitra, S., & Banerjee, P. (2020). The role of small millets as functional food to combat malnutrition in developing countries. *Indian Journal of Natural Sciences*, *10*(60), 20412-20417.
3. Jamal, T., Ghosh, L., Maity, D., Banerjee, S., & Banerjee, S. (2023). Millets: The Nourishing Solution to Food Security Challenges Over Cereal-Based Cropping Systems. *International Journal of Environment and Climate Change*, *13*(12), 417-426.

MILLETS: THE NATURAL FOOD

Ms. Aanal Maitreya

Millets are a group of small- grained cereal and are sustainable food crops. They are being increasingly favored by the farmers as these grains are climate- friendly and highly tolerant to drought and other extreme weather conditions and can be grown in infertile soil conditions. They have characteristics like photo- insensitivity, resilience to climate change, etc. these cereal grains belong to the Poaceae family, commonly known as the grass family.

Superfoods like millets may hold the key to addressing the growing number of metabolic and gut-related illnesses. Superfoods are the kind of foods that make the claim that their extraordinary nutrient density confers health advantages. Once a staple grain on Indian plates, millets are now almost entirely replaced by rice and wheat as the basic foods in the modern Indian diet.

Unlike rice and wheat, millets are a strong source of micronutrients such as vitamins A, B, D, E, niacin, pyridoxine, antioxidants, iron, and zinc. Millets have high protein content (10-12.3 g/100 g), fat (1% to 5%), iron (0.5-19 mg) and calcium (10-410 mg) compared to rice and wheat. In addition to being high in energy and key orientin, apigenin, luteolin, quercetin, and hydroxycinnamic acid. These polyphenols contain anti-inflammatory and free radical- scavenging properties in addition to antioxidant properties. The flavonoids in finger millets are greatest, and the phenolic acids in Foxtail, Pearl, and Proso millets are highest. The most prevalent form of hydroxycinnamic acid, which possesses strong antioxidant qualities, is ferulic acid. It has been discovered that Finger millets' seed coat has antibacterial and antifungal qualities. Millets have the added benefit of boosting immunity in addition to offering complete nutrition. There are seven millets that became extremely popular in recent times:

- Finger millet
- Sorghum millet
- Little millet
- Barnyard millet

Importance of millets:

- Climate resilient crop
- Nutritional security
- Economic security

References:

1. https://www.hindustantimes.com/lifestyle/health/superfood-in-news-7-millets-that-were-all-the-rage-in-2023-101702901188058.html
2. Jena, A., Sharma, V., & Dutta, U. (2023). Millets as superfoods: Let thy cereal be thy medicine. *Indian Journal of Gastroenterology*, *42*(3), 304-307.
3. Soumya, K., Kavya Yadav, G. A., & Vijay, R. (2023). Millets as Superfood. *Just Agriculture*, *3*, 163-9.

MILLETS DIVERSITY

Mr. Ganapat Bavaliya

The Indian government suggested to the United Nations that 2023 be designated as the International Year of Millets in order to increase demand for millets both domestically and internationally and to feed people a healthy diet. On March 5, 2021, the United Nations General Assembly (UNGA) proclaimed 2023 as the International Year of Millets, following the endorsement of India's request by 72 other nations. As a result, on February 1, 2022, the Honorable Union Finance Minister announced the budget: It has been declared that 2023 would be the International Year of Millets. Post-harvest value addition, increasing local consumption, and national and international branding of millet goods will all receive support. Millets are warm-weather annuals with small grains that are members of the grass family. The three main millets grown in India are ragi (finger millet), bajra (pearl millet), and jowar (sorghum). We also grow small millets in our nation, such Proso (Cheena), Kodo (Kodra, Arikelu), Fox tail (Kangni/Korra), Barnyard (Varai, Sawa), and Little millet (Kutki). Since other food crops cannot be grown in the semiarid tropics due to limited rainfall and poor soil fertility, millets are the staple crops of that region (Amir et al., 2023). Just 2% of cereals produced worldwide are millet, and 95% of millet is produced in Asia and Africa. Millets are members of the Poaceae (Gramineae) family of grasses. Millets make up the subfamily Panicoideae: Panicum miliaceum L., commonly known as broomcorn millet, is primarily grown in China, Afghanistan, India, and Turkey; Pennisetum glaucum L., also known as pearl millet, is primarily grown in Africa, India, and the United States; and Setaria italica L., also known as foxtail millet, is primarily grown in Eurasia, China, India, and Australia; Echinochloa esculenta (A. Braun) H. Scholz (Japanese Barnyard Millet), also known as white millet, is primarily grown in Japan, China, and Korea. Digitaria exilis Stapf (White Fonio) and Digitaria iburua Stapf (Black Fonio), sometimes known as Hungry rice, are largely grown in Africa's Sahel region. Echinochloa frumentacea Link (Indian Barnyard Millet) also known as Sama is mostly grown in India, and china. Panicum sumatrense Roth (Little Millet) also known as Blue panic, is mostly grown in China, Pakistan, India, Nepal, Malaysia and Paspalum scrobiculatum L. (Kodo millet) also known as Kodra is mostly grown in India. Conversely, the subfamily Chloridoideae includes Eleusine coracana L. (Finger millet), also known as Ragi in India, which is mostly grown in Eastern and Southern Africa, India, Nepal, and China, and Eragrostis tef (Zuccagni) Trotter (Teff millet), also known as Abyssinian lovegrass, which is mostly grown in Ethiopia, Eritrea, and South Africa (Salim et al., 2023).

References:

1. Amir, M., Akhtar, S., & Hameed, A. (2023). Grain Millet: Potential to fill nutrition gaps in the context of food security and climate change. In *Neglected Plant Foods Of South Asia: Exploring and valorizing nature to feed hunger* (pp. 261-281). Cham: Springer International Publishing.
2. Saleem, S., Mushtaq, N. U., Shah, W. H., Rasool, A., Hakeem, K. R., Seth, C. S., ... & Rehman, R. U. (2023). Millets as smart future food with essential phytonutrients for promoting health. *Journal of Food Composition and Analysis*, 105669.

NUTRITIONAL VALUE AND HEALTH BENEFITS OF MILLETS

KM Bhavna Singh

For the first time in history, more than 50 percent of the world's population now lives in towns and cities. By 2050, this number is expected to increase to 66 percent. The shift from rural to urban areas. is due to poverty and related socio-economic factors. Health is one of the major factors which is reduced in urban areas due to deficiency of many nutrients and poor diet. Millets are one of the heavy nutritional foods. Due to lack of nutritional in our diet we suffer from such kind of disease like diabetes, cancer and celiac disease. Millets are rich in both soluble and insoluble fiber, which aids digestion, promotes gut health, and helps regulate blood sugar levels. They contain essential vitamins like B vitamins (B1, B2, B6, and niacin), which support energy production, brain function, and red blood cell formation. Millets are a good source of minerals like iron, magnesium, zinc, and phosphorus, which are crucial for various bodily functions.

Health Benefits:

Digestive Health**:** The fiber content in millets promotes healthy digestion and prevents constipation.
Blood Sugar Control: Millets' complex carbohydrates can help regulate blood sugar levels, making them a beneficial choice for individuals with diabetes.
Heart Health: The soluble fiber in millets can help lower cholesterol levels, reducing the risk of heart disease.
Nutrient-Dense: Millets provide a wide range of essential nutrients, making them a nutritious addition to your diet.

References:

1. Dayakar Rao, B., Bhaskarachary, K., Arlene Christina, G. D., Sudha Devi, G., Vilas, A. T., & Tonapi, A. (2017). Nutritional and health benefits of millets. *ICAR_Indian Institute of Millets Research (IIMR) Rajendranagar, Hyderabad*.

2. Amadou, I., Gounga, M. E., & Le, G. W. (2013). Millets, nutritional composition, some health benefits and processing. *Emir J Food Agric*, *25*(7), 501-508.

3. Sarita, E. S., & Singh, E. (2016). Potential of millets: nutrients composition and health benefits. *Journal of Scientific and Innovative Research*, *5*(2), 46-50.

MILLETS: A SUSTAINABLE SOLUTION

Ms. Dhruva Jani

India, despite being an agriculturally based country due to being the second most populous country in the world, faces enormous challenges in satisfying the food demands of its population. Millets offer an answer to this problem as they are highly diverse and available to adapt to a variety of climatic circumstances. For dryland farmers with little resources, these crops are sustainable because grain production requires few inputs and is resistant to climate variations. In a world where malnutrition is the biggest health risk globally, accounting for 11% of the global illness burden, ending hunger continues to be a primary concern. Due to its genetic and species diversity, millets have shown significant potential in the food industry. They are ideal for contingency crop planning because of their adaptability to different soil types and elevations and capacity to grow in both early and delayed planting conditions. Besides this, they have the ability to withstand places with low and heavy rainfall, so farmers can also prevent crop failures and get stable harvests by using drought-tolerant and eco-friendly. Globally India is one of the largest producers of millets about 12 different types of millets of which top 9 are grown in India as shown in the figure

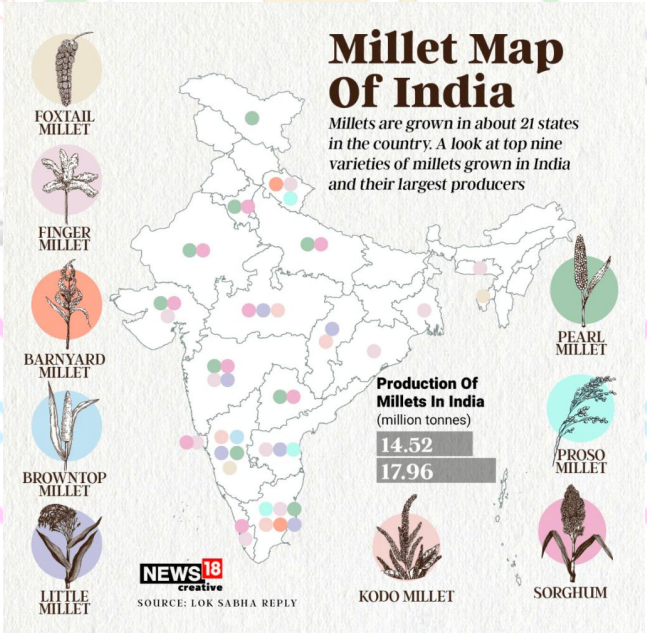


Fig: Distribution of Millets in India

Nutri cereals, also referred to as millets, are a popular choice because they are gluten free, high in protein, dietary fibre, and micronutrients including vitamins and minerals. Numerous health benefits are linked to various species of millet, all of which share the important goal of growth and development. These benefits include the treatment of calcium deficiency, hypercholesterolaemia, hypoglycaemia (low blood glucose), dyspepsia, poor digestion, improved bowel health, cardiovascular disease treatment, higher blood glucose, and increased lipid levels. Because millets have so many health advantages, they may be used to prepare nutritious meals for individuals of all ages. Thus, millets offer a sustainable answer to India's food security challenges while providing significant health benefits, making them a vital crop for both agricultural and nutritional well-being.

References:

1. Rhythm Kalsil (2023) Diversity in millets and their nutritional benefits: An overview. *Pharma Innovation;12*(5):2375-2379.
2. https://www.fssai.gov.in/upload/uploadfiles/files/Guidance_Notes_Version_2_Millets_29_01_2020.pdf
3. https://www.millets.res.in/pub/2018/The_Story_of_Millets.pdf

MILLETS -THE NATURAL SUPER FOOD

Mr. Mohitgir Goswami

The Global Food Policy Report (2024) envisions healthy nourishment from foods which are more desirable, affordable and accessible [1]. Currently, the human population around the world is facing two diametric problems of malnourishment and obesity. A balanced diet is often out of reach for billions of people residing in under-developed and developing countries. In the present day, millets present a feasible solution to the global food and nutritional security crisis, which continues to be one of the major problems for the world [2]. According to India Science, Technology and Innovation Portal, Millets or Nutri cereals are a group of small – seeded grains grown in more than 130 countries worldwide [3]. Besides being an attractive nutrient-dense alternative to conventional food grains, research suggests that millets also show a rich profile of phytochemicals that shows cardiovascular and celiac diseases (gluten-induced) relief; anti-diabetic, anti-cancer, as well as anti-inflammatory properties [2]. Furthermore, incorporation of millets in common diet is a relatively manageable task as several popular food preparations like puffed and flaked millets, noodles, pasta (millet + wheat + soy flour), vadagam, shankarpara (flakes), sorghum cookies, etc. are already available in the market. One of the leading producers of millets is India, and as these grains can withstand drought conditions, Indian farmers have been growing them on an increasing scale. As part of its National Food Security Mission, the Government of India has also been encouraging the cultivation of millets. As a result of these factors, millet production in India is expected to grow further in the coming years [4]. Along with anthropogenic advantages, millets also offer environmental benefit as they are a group of resilient crops that offer sustainable solutions for agricultural production. By integrating millets into our agri-economy, we can foster resilience against climate change and enhance self-reliance in food production, empowering rural communities [2]. The revival of interest in millets signals an auspicious shift towards more diverse, healthy, and sustainable food systems. The significance of millets is that they invite collective action from stakeholders across sectors, including lawmakers, researchers, agrarians, and consumers [2]. By understanding the potential of millets, we can pave the way for fulfilment of 2nd SDG of a more resilient, adequate, and nourished future for all.

REFERENCES

1. International Food Policy Research Institute. 2024. 2024 Global Food Policy Report: Food Systems for Healthy Diets and Nutrition. Washington, DC: International Food Policy Research Institute. https://hdl.handle.net/10568/141760

2. Sanjay Kumar, T., Nageswari, R., Somasundaram, S., Anantharaju, P., Baskar, M., Ramesh, T., ... & Subrahmaniyan, K. (2024). Significance of millets for food and nutritional security—an overview. Discover Food, 4(1), 73. 3. https://www.indiascienceandtechnology.gov.in/listingpage/millets-future-food 4. https://apeda.gov.in/milletportal/about_us.html

FINGER MILLET THE FUTURE FOOD

Mr. Trupesh Revad

The optimization of human genetic potential and sustainable health are both influenced by nutritional well-being. Millets are a group of tiny, edible grasses that belong to the grass family (Gramineae/paniceae). They are also known as coarse cereals. In total, there are 20 species spread throughout around 10 genera.

Eleusine coracana L., or finger millet, is widely grown throughout the world and in many parts of India. It is also referred to as ragi or mandua. India accounts for around 60% of the world's finger millet production, making it the leading producer. It grows more quickly-between 100 and 130 characteristics is its adaptability to various agroclimatic circumstances, which accounts for its best yield among all millets. It is commonly grown in the Indian states of Tamil Nadu, Adhra Pradesh, Karnataka, and some regions of North India.

Finger millet, a staple grain in many regions of India and outside, is marketed as being incredibly

healthful. After review, its nutritional and functional qualities were determined to be the finest of all cereal grains. Its powerful contribution to human nutrition comes from its vitamins, minerals, fatty acid content, and antioxidant qualities.

Value added products from finger millet-chapatti(roti), puffing or popping, papad, malting-weaning food, extruded products, noodles-vermicelli, fermented foods, ragi soup.

Photo from https://wikifarmer.com/how-to-grow-finger-millet-a-comprehensive-guide/

References-

1. Gull, A., Jan, R., Nayik, G. A., Prasad, K., & Kumar, P. (2014). Significance of finger millet in nutrition, health and value-added products: a review. *Magnesium (mg)*, *130*(32), 120.
2. Hassan, Z. M., Sebola, N. A., & Mabelebele, M. (2021). The nutritional use of millet grain for food and feed: a review. *AgrRiculture & food security*, *10*, 1-14.

3. Singh, P., & Raghuvanshi, R. S. (2012). Finger millet for food and nutritional security. *African Journal of Food Science*, *6*(4), 77-84.

GLIMPSES OF ACTIVITIES OF GUJARAT UNIVERSITY BOTANICAL SOCIETY
