ROLE OF MILLETS IN PROMOTING HEALTH AND RESILIENCE: A REVIEW

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ABSTRACT

Millets are the small-seeded, underexploited, sacred grains of the family Poaceae. They have been utilized from time immemorial with great significance and are widely accepted owing to their promising health benefits. Millets are often referred to as the future super foods. High-yielding varieties such as wheat and rice were given priority after the emergence of green revolution which gradually limited millet cultivation in turn their consumption in India. Aiming at increasing production and consumption of millets, UNO declared 2023 as the 'international year of millets'. In this article, an attempt is made to discuss the nutritional and functional properties of millets such as great millet, pearl millet, finger millet, foxtail millet, kodo millet, little millet, barnyard millet and proso millet based on around 60 articles between 2000 and 2024 from Food and Agricultural Organization of the United Nations [FAO], National Institute of Nutrition [NIN], Indian Institute of Millets Research [IIMR], ASSOCHAM, Scopus, WoS, Google Scholar, Crossref, PubMed, Indian Journals.com, Creative Commons and DOAJ etc. This review aims to succinctly provide an overview of the health-promoting potential of various millets. This review also provides crucial information on the global and Indian scenarios of millet production, consumption, the prevalence of obesity, the beneficial role of millets, millet promoting campaigns of various states in India and suggests measures to improve millet consumption. Hence this review endeavors to highlight the nutritional and health benefits of the underutilized millets. Literature analysis revealed that millets are highly beneficial in terms of their nutritional sufficiency since they are extremely rich in macro and micronutrients such as proteins, complex carbohydrates, essential fatty acids, vitamins, minerals, antioxidants and a splendid source of dietary fibers. Millets possess anti-hyperglycemic, anti-cholesterol, anti-hypertensive, anti-cancer, anti-inflammatory, anti-oxidant, and anthropometric effects. Their gluten-free property averts celiac disease and IBS. They possess significant neutraceutical, prebiotic and alkaline farming properties. Hence, the substitution of millets with the present major staples viz., rice, wheat and maize could be useful evidently in promoting health and resilience.

Keywords: Millets, Health, Resilience, Obesity, Gluten-free food, Future foods, Millet year, Major staples

Introduction:

In this current scenario with an exploding population and indiscriminate use of natural resources, plant resources are fast depleting and there is a need to explore new alternatives. There are many underutilized or neglected crops which have great potential in terms of their nutritional and neutraceutical role and ability to achieve food security to replace the major food crops such as wheat and rice. Millets are important underutilized crops with significant nutri-cereal potential. Millets are extremely nutritive, gluten-free, non-acid-forming and rich in dietary fiber. Despite these facts, their consumption is still limited to the conventional ethnic groups, traditional and poor populations due to lack of awareness of their nutritional importance, lack of millet processing technologies, lack of food subsidies by the governments, inconvenience in food preparations etc. making them more obsolete [Saini *et.al*, 2021].

There has been a drastic increase in the consumption of simple carbohydrates such as glucose, fructose, and saturated and trans fat since the past century, due to their indiscriminate use in processed foods, such as jams, jellies, fast foods, soft drinks etc. The consumption of these foods will lead to lipo-inflammation and oxidative stress, due to their pro-inflammatory and oxidative nature [Ter Horst and Serlie, 2017]. Inflammation leads to the increased production of liver triglycerides [TG] that increase the fat deposition in tissues thus leading to obesity and inflammatory response through tumor necrosis factor-α [TNF-α] and nuclear factor kappa B [NF-κB] [Izaola *et. al*, 2015]. Lack of physical activity, increased consumption of processed food, insufficient dietary fiber in food and genetic predisposition also contribute to obesity. Millets are a substantial alternative in combating obesity owing to their rich source of dietary fiber and complex carbohydrates.

According to FAO STAT. Rome, 2023, adult obesity has increased rapidly in every region of the world during the last two decades. In the year 2007 adult obesity was 8.7% and it reached 13.1% in 2016. It is prevalent in Oceania, Northern America and Europe, followed by Latin America and the Caribbean. Adult obesity in Africa and Asia is lower than the world average; however, it has been steadily increasing. The 20 countries with the highest obesity were clustered in the Pacific islands, the Middle East and North Africa in which, 30% or more of them are obese [Fig.1]

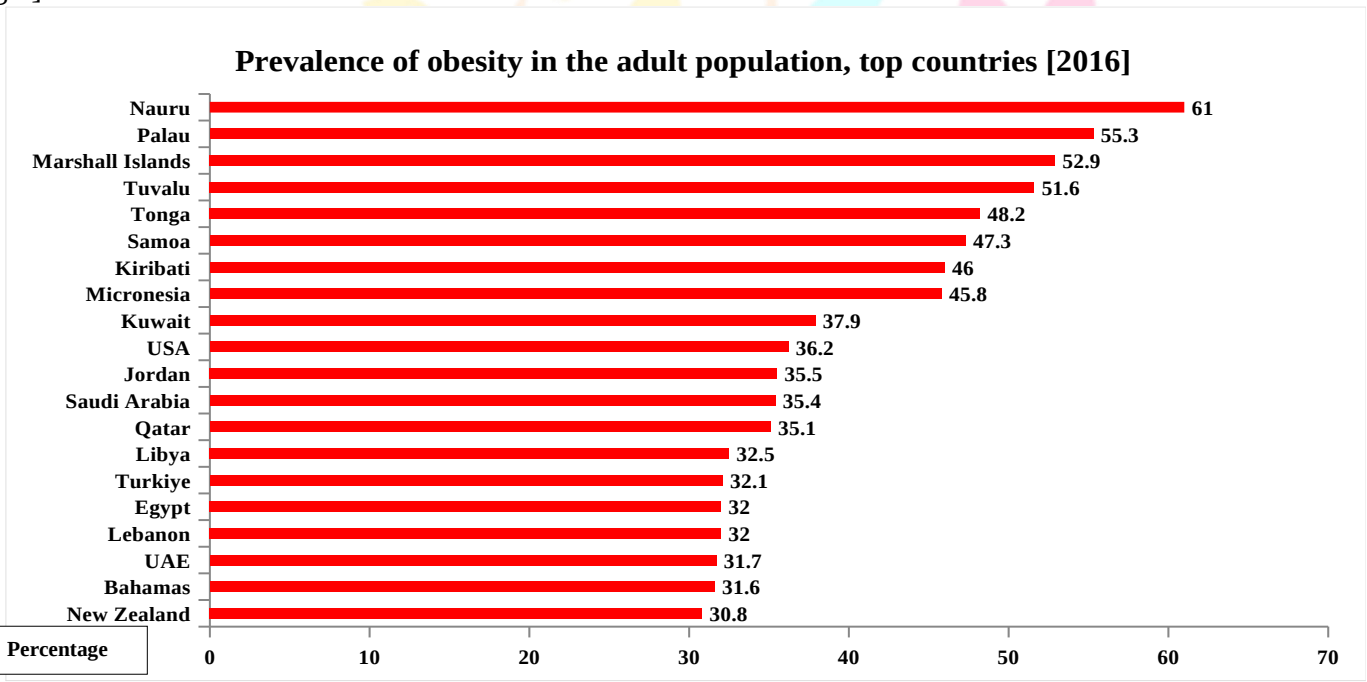

Fig.1: Prevalence of obesity in the adult population, top countries [2016], Source: FAO. 2023. Suite of Food Security Indicators. In: FAOSTAT. Rome. [Cited October 2023].

Millets are essential in dispensing appropriate nutrients and have been proven to be beneficial role for disorders of lifestyle. The knowledge of nutrition and health care research supports the potential of their phytochemicals, such as polyphenols and flavonoids on human health. Hence, there is no need to search for newer food sources with the desired functional characteristics. Millets are the major staple food crops in India, especially for conventional and low-income families. Their value in terms of nutrition is widely popular because of their high content of phenolic compounds [0.03%–3%], dietary fiber [18%], and calcium [0.38%] [Kumar *et.al*. 2023].

Millets are tiny, round minor grains of the small seeded-grass family [Poaceae]. They have the remarkable ability to survive in less fertile areas, are drought and pest-resistant, with short life spans and are cultivated around the year and all over the world. Millets have uniqueness because of their richness in protein, calcium, dietary fiber and polyphenol compounds [Devi *et. al*, 2011]. The millets were being consumed since the beginning of human civilization; millets are considered as first domesticated cereals by man [Shahidi and Chandrasekara, 2013]. The word ‘millet’ is derived from the French word ‘mille’ which means ‘thousand’ implying a handful of millet can hold

thousands of grains. Millets have great climatic adaptability and nutritional sufficiency and thus have great potential in promoting health and resilience and achieving health security. Cereals such as rice and wheat are the major nutrient vehicles for the majority of the population but unfortunately poor in protein, dietary fiber and essential nutrients, whereas the second most abundant nutrients in millets are proteins hence these grains can be used as preferable alternatives for plant-based proteins, dietary fiber and other essential nutrients. Millets offer several advantages due to their rapid life cycle and stress-adaptive traits. Their short stature, small leaf area, thicker cell walls, and deep root systems contribute to their resilience (Kencharaddi *et al*., 2024; Patan *et al*., 2024). Hence, this comprehensive review is written aiming to succinctly provide an overview of the available literature on the nutritional and health-promoting role of millets.

Global scenario of millets:

According to FAO statistics [2019], world production of millets is 863 lakh tonnes from an area of 718 lakh hectares. Africa is the largest producer of millets [423 lakh tonnes] followed by Asia [215 lakh tonnes] and India is the top world producer of millets [173 lakh tonnes] [Table-1].

Table-1: Global Scenario of Millets–Area and Production Region Wise [2019] [Source: FAO Stat 2021]

Regions	Area[Lakh Hectare]	Production[Lakh Tonne]
Africa	489 [68%]	423 [49%]
Americas	53 [7%]	193 [23%]
Asia	162 [23%]	215 [25%]
Europe	8 [1%]	20 [2%]
Australia and New Zealand	6 [1%]	12 [1%]
India	138 [20%]	173 [20%]
World	718	863

Indian scenario of millets:

The major millet crops procured by the Indian Government are jowar, bajra, and ragi. During the last five years, the quantum of jowar, bajra and ragi procured by the Government are 423675 metric tonnes, 758094 metric tonnes and 1676067 metric tonnes respectively. The total millet production in India during 2018-19, 2019-20, 2020-21, 2021-22 and 2022-23 was13711.21,17260.63,18020.55,15999.76 and 17151.75 respectively[Table-2].

Table-2: The state-wise production of millets in India during 2018-19 to 2022-23. *As per 3rd Advance Estimates 2022-23. This information was given by the Union Minister of Agriculture and Farmers' Welfare, Shri Narendra Singh Tomar in a written reply in Lok Sabha. SK/SS/2567 [Release ID: 1947884] Visitor Counter: 4909.

State/UT	2018-19	2019-20	2020-21	2021-22	2022-23*
A.P	301.91	514.19	540.61	359.15	299.64
Assam	3.06	3.23	3.26	3.20	3.23
Bihar	14.37	8.00	10.31	8.51	7.18
Chhattisgarh	33.71	24.56	26.24	28.18	23.39
Gujarat	1000.15	990.48	1091.97	1179.08	1221.87
Haryana	899.56	1034.90	1366.56	1132.15	1213.97
H.P	5.95	6.81	3.12	2.49	2.41
Jharkhand	12.77	14.31	17.72	18.07	47.60
Karnataka	1762.17	2555.60	2569.08	2053.60	2115.88
Kerala	0.47	0.54	0.57	0.60	0.29
M.P	851.34	895.71	1024.13	1181.40	1276.09
Maharashtra	1319.31	2428.70	2513.82	2305.38	2076.35
Odisha	48.18	48.07	55.16	68.08	59.22
Punjab	0.72	0.32	0.26	0.76	0.41
Rajasthan	4288.34	5146.89	5155.67	4279.74	5633.57
Tamil Nadu	873.47	1017.03	905.26	765.48	590.79
Telangana	72.25	139.15	166.33	122.76	79.03
Uttar Pradesh	1967.27	2171.91	2298.20	2225.65	2249.66

Uttarakhand	179.74	191.09	200.85	200.38	181.62
West Bengal	7.57	9.83	6.98	7.74	7.83
Others	68.91	59.32	64.44	74.30	61.72
All India	**13711.21**	**17260.63**	**18020.55**	**15999.76**	**17151.75**

Types of Millets

Millets are the important grains of Africa and Asia especially in Nigeria, Niger and India which contribute 97% millet production in developing countries [Mc Donough *et.al*, 2000]. Millets are insignificant in developed nations, for example, only Proso millet is significant in USA, and it is mostly cultivated for bird feed purpose. Millets are broadly classified into two types viz., major millets and minor millets. Major millets are pearl millet, which is most widely used for human consumption [ICRISAT, 2022], foxtail millet or Italian millet [Yang *et.al*, 2012], proso millet or white millet and finger millet or small millet. Whereas minor millets include barnyard millet, kodo millet, little millet, guinea millet, brown top millet, teff millet, fonio millet, sorghum or great millet and job's tears or adlay millet [Adekunle 2012, Chinchole *et.al*, 2017]. Botanists also have counted two pseudo millets, buckwheat and amaranth. In this article, eight most common millets viz., sorghum or great millet, pearl millet, finger millet, foxtail millet, little millet, kodo millet, barnyard millet and proso millet are discussed. Teff millet is widely cultivated in Ethiopia, is not strictly a millet and other millets such as brown top millet, fonio millet and jobs tears are of less importance and hence not included in this review [Table-3].

Table-3: Various types of Millets – Their Scientific and Vernacular Names of Telugu and Tamil

Scientific name	**English**	**Telugu**	**Tamil**
Sorghum bicolor	Great Millet	Jonnalu	Cholam
Pennisetum glaucum	Pearl Millet	Sajjalu	Kamboo
Eleusine coracana	Finger Millet	Ragulu	Kelvaragu
Setaria italica	Foxtail Millet	Korralu	Tenai
Panicum miliaceum	Proso Millet	Varigalu	Panivaragu
Paspalum scrobiculatum	Kodo Millet	Arikalu	Varagu
Echinochloa crusgalli	Barnyard Millet	Udalu	Kuthiravaali
Panicum sumatrense	Little Millet	Samalu	Samai

Source: Nutritional and health benefits of millets, ICAR-Indian Institute of Millets Research [IIMR], HYD., [2017]

The general structure of millet grain

Millets are the small-seeded, grains of the family Poaceae. Structurally millet has outer pericarp, seed coat or testa, aleuron layer, endosperm and germ or embryo. The embryo has a cotyledon called scutellum and a short embryonic axis consisting of plumule and radicle. The millets can be divided into two types of fruits: utricles and caryopses. In utricle, the pericarp is not intimate with the seed but is attached at only one point. Finger millet, foxtail millet and proso millets are utricles where the pericarp usually breaks away from the seed coat, which is thick and forms a tough barrier over the endosperm. Whereas in a caryopsis, the pericarp is completely attached to the seeds. Sorghum, pearl millet, fonio and teff are caryopses. In pearl millet, the grains are composed of the pericarp, endosperm and embryo. The endosperm is the largest or bulky among all the parts of millet and is a major storage tissue of starch and proteins. The aleurone layer is the outer covering of endosperm and is rich in minerals, B-complex vitamins, oils, proteins and some hydrolyzing enzymes. Scutellum is rich in lipids, proteins, enzymes and minerals. The chief source of dietary fiber is the pericarp [Fig.2].

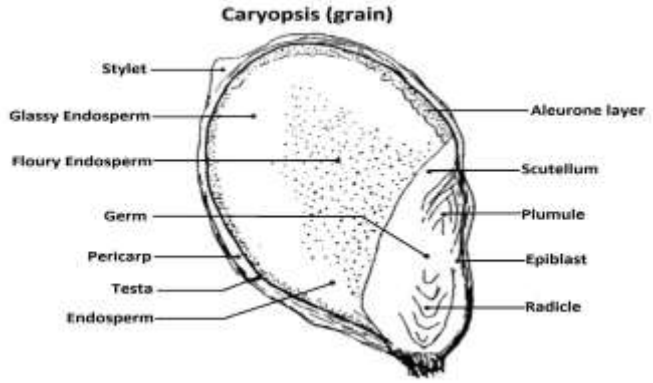

Fig. 2: The general structure of millet grain [Adopted from Nutritional and health benefits of millets, ICAR-Indian Institute of Millets Research [IIMR], Hyderabad [2017].

Potential Health Benefits of Millets

Millets are not only rich sources of nutrients such as carbohydrates, proteins, dietary fiber and good fat and have significantly higher amounts of minerals like calcium, iron, potassium, zinc, magnesium, manganese, and B-complex vitamins, making them a preferable choice over the negative cereals such as rice and wheat.

Foxtail millet reduces the risk of colon cancer, lowers the cholesterol level, exhibits anti-diabetic property and attenuates alcohol-induced hepatic damage. It's gluten-free property averts the celiac disease.[Ren *et. al*, 2016 and Yang *et.al*, 2020]. Foxtail millet also acts as an anti-hyperglycemic and anti-lipidemic agent in type-2 diabetic conditions and inhibits pro-inflammatory and hypertrophic responses. [Choi *et. al*, 2005 and Sireesha *et. al*, 2011].

Pearl millet improves the immune system by inhibiting Shigella-induced pathogenicity. It also reduces damage to soft tissue and facilitates the healing process.[Ganguly *et.al*, 2019]. Pearl millet reduces the level of triglycerides in turn prevents heart diseases. It is a natural source of antioxidants and lowers the incidence of inflammatory bowel diseases [IBD] [Chandrasekara and Shahidi, 2011, Kim and Je, 2016, Liu *et.al*, 2015 and Islam *et.al*, 2015].

Finger millet lowers plasma triglycerides, thus reduces the risk of cardiovascular disease [Sarita and Singh, 2016]. Finger millet lowers the risks of diabetes mellitus and gastrointestinal tract disorders and enhances the ability to scavenge free radicals [Muthamilarasan, 2016].

Kodo millet minimizes glycemic index and diabetes occurrence and also has antioxidant actions. [Sarita and Singh, 2016].

Celiac disease can be prevented by consuming proso millet due to its gluten-free nature. Being a low-glycemic index [GI] food reduces the risk of type-2 diabetes [Tyl *et.al*, 2018 and Das *et.al*, 2019]. Proso millet improves the glycemic responses and plasma glucose levels and also defends D-galactosamine- induced injury of the liver [Park *et.al*, 2008 and Ito *et. al*, 2008].

Little millet reduces the serum cholesterol level, fasting and post-prandial blood glucose, and lipid parameters during diabetes mellitus [Surekha, 2004 and Srilekha *et.al*, 2019]. The polyphenol content of little millet greatly helps to prevent various metabolic disorders [Almaski *et.al*, 2017].

Barnyard millet damages the apoptotic cells thus reduce the risk of colorectal cancer. It also inhibits the glycation and glycoxidation of proteins that improves the state of diabetes [Ramadoss and Sivalingam, 2019, Anis and Sreerama, 2020]. Barnyard millet also inhibits cancer-developing cells and lowers blood glucose and lipid levels [Ugare *et.al*, 2011 and Sharma *et.al*, 2016].

Millets also contain many bioactive chemical compounds such as lignans, β-glucan, inulin, resistant starch, phenolic compounds [e.g., ferulic acid, caffeic acid and quercetin], feraxans, and sterols. Studies have proved the role of polyphenols of millets in antioxidant, anti-cancer, anti-viral, anti-inflammatory and neuroprotective activities which in all have shown to be beneficial against diseases like cancer and cardiovascular disease, diabetes, hypertension, high cholesterol, inflammatory diseases, metabolic syndrome and Parkinson's disease [Dayakar *et. al*, 2017]. Ferulic acid stops tissue damage and promotes the wound-healing process [Saritha and Singh 2016]. Phytic acid is an anti-oxidant that protects the DNA from its damage and prevents cancer and plays an important role in lowering body cholesterol [Amadou, 2013 and Chandra *et.al*, 2020]. Phenols, phytates, and tannins of millets are critical in curing ageing and metabolic disorders, inhibiting the worsening of human well-being, cancer, and cardiovascular illnesses, lowering blood pressure, diabetes and reduce tumors [Siwela *et.al*, 2007 and Thilagavathi *et. al*, 2015]. Magnesium present in millets reduces the risk of myocardial infarction [heart attack] and plays a vital role in the growth of body tissue and energy metabolism [Chandra *et.al*, 2020]. Flavonoids of finger millet inhibit α-glucosidase and α-amylase activities [Ofosu *et. al*, 2020]. Carotenoids of finger millet help in the quenching of single oxygen and free radicals [Viswanath *et.al*, 2009].

Apart from this, millets also contain some essential fatty acids like linoleic, oleic and palmitic acids found in free form and monogalactosyl, digalactosyl diacylglycerols, phosphatidyl serine, phosphatidyl choline and phosphatidyl ethanolamine, in the bound form [Bagdi *et. al*, 2011]. They also contain other fatty acids such as arachidonic acid, behenic acid and erucic acid are found in trace amounts. Millet oil could be an adequate source of linoleic acid and tocopherols [Amadou, *et al*, 2011]. Millets are good alkaline-forming agents that aid in good mucosal health [Moreno, *et al*, 2014]. It is found that millets contain a significant amount of sulphur-containing essential amino acids like methionine and cysteine [Obilana, 2002].

Millets favour the existing gut flora or aid in repopulating the colon when bacteria levels are depleted during infection or by antibiotics, chemotherapy etc [Abd El-Salam *et. al*, 2012]. According to Lei *et.al*, [2006], fermented millet products act as a natural probiotic solution for diarrhoea in young children. In Africa, millet koko is prepared in the form of fermented millet porridge and lactic acid-fermented porridge as well [Amadou, *et. al*, 2011].

Millets have innumerable neutraceutical properties that are helpful to combat many health issues such as hypertension, risk of heart disease, prevention of various cancers and cardiovascular diseases[CVD], decreasing the tumour incidence etc. Other health benefits are increasing the period of gastric emptying, lowering the sugar cravings, provides roughage to the gastro intestine which is essential for bowel movements and gut health [Gupta *et. al*, 2012] [Table-4].

The high protein content of millets supports healthy growth and development in children and athletes. Their rich levels of calcium stimulate bone development and lower the risk of bone fractures. In addition, millets have high-quality iron, which restores the iron deficiency [Prathusha *et. al*, 2021].

Millets are often called as powerhouse of micronutrients such as iron, zinc, calcium, and magnesium, which are essential for preventing diseases caused by deficiencies, such as anemia and osteoporosis [Kumar *et al.*, 2024].

Incorporating millets into regular diets can substantially alleviate hidden hunger by providing essential micronutrients in bioavailable forms, this is especially crucial in low- and middle-income countries, where diets often lack diversity and are predominantly composed of calorie-dense but nutrient-poor staples like rice and wheat (Mazumder *et al.*, 2024).

Table-4: Nutritional and Dietary Fiber composition of millets in comparison with Rice and Wheat per 100g

Millet	Protein [g]	Total Fat[g]	Carbohydrate[g]	Energy [Kcal]	Dietary Fiber[g]	Ca [mg]	Mg [mg	Zn [mg]	Fe [mg]	Vit. B1 [mg]	Vit B2 [mg]	Vit B3 [mg]	Vit B5 [mg]	Vit B9 [µg]
Great Millet	09.97	1.73	67.68	334	10.22	27.6	133	1.9	3.90	0.36	0.14	2.10	0.27	39.4
Pearl Millet	10.96	5.43	61.78	347	11.49	27.4	124	2.76	6.42	0.26	0.20	0.86	0.50	36.1
Finger Millet	07.16	1.92	66.82	320	11.18	364	146	2.5	4.60	0.37	0.17	1.30	0.29	34.7
Kodo Millet	08.92	2.55	66.19	331	06.39	15.2	122	1.65	2.34	0.29	0.20	1.49	0.63	39.9
Little Millet	10.13	3.89	65.55	346	07.72	16.1	91.4	1.82	1.26	0.26	0.05	1.29	0.60	36.2
Foxtail Millet	12.30*	4.30*	60.09*	331*	06.70**	31.0	81.0	2.4	2.80	0.59*	0.11*	3.20*	0.82*	-
Barnyard Millet	06.20*	2.20*	65.55*	307*	12.6***	20.0	82.0	3.0	5.00	0.33*	0.10*	4.20*	-	-
Proso Millet	12.50*	1.10*	70.04*	341*	08.5****	14.0	153	1.4	0.80	0.41*	0.28*	4.50*	1.20*	-
Wheat	10.60	1.47	64.70	321	11.23	39.3	125	2.85	3.97	0.46	0.15	2.68	1.08	30.1
Rice	07.94	0.52	78.24	356	02.81	07.4	19.3	1.21	0.65	0.05	0.05	1.69	0.57	9.32

Source: Indian Food Composition Tables [IFCT], ICMR-NIN – 2017 *Nutritive value of Indian foods, NIN- 2007 **Jaybhaye *et.al* [2014], ***Ugare *et. al* [2014] **** Das *et.al* [2019]. Note**:**The significant nutrient and dietary fiber values are highlighted in green.

Various millet-promoting campaigns of India

Declaration of the 'National Year of Millets' by India in 2018 and the 'International Year of Millets' by the United Nations in 2023 are two important milestones in popularizing millets in India and across the world. The Indian government has initiated and intervened in many millet-promoting campaigns in India. The Department of Agriculture and Farmers Welfare has started a 'Sub-mission on millets' under the National Food Security Mission that supports interventions such as the formation of farmer-producer organizations [FPO] and setting up centers of excellence and seed hubs for millets. Ministry of Women and Child Development included the millets in the 'Poshan Abhiyan' scheme. The Food Safety and Standards Authority of India is creating awareness to promote the use of millets or 'Shree Anna' as part of a healthy and heterogeneous diet under the 'eat right campaign'. An export promotion forum is set up that is dedicated to facilitate, promotion, marketing and development of millet exports from India. 'Food of the Future' is the campaign of Karnataka to encourage the cultivation of millets, under which the farmers are encouraged with a grant of 10,000 rupees per hectare. The Organic Agriculture and Coarse Grain Promotion Scheme of Karnataka is also promoting organic farming and coarse grain under 'Savayava Bhagya Yojana'. Telangana State Agricultural University is providing technical support to small and medium-scale millet industries and organizing various skill development programmes to strengthen the millet value chain. Indian Institute of Millet Research is a premier research institute engaged in basic and strategic research on millets. Khadarvali, the 'millet man of India' has been relentlessly working to bring back 'Siridhanya' or 'Positive Millets' for 20 years. 'Deccan Development Society' is an Indian Agri-based NGO started in 1983 is a grassroots organization working in about 75 villages with about 5,000 women in Telangana state in India. It has its elaborate seed bank and own

operated FM radio station by which it broadcasts different topics on millet crops, traditional technologies and village folk songs. They are encouraging the urban food consumers to adopt the organic and millet food culture by their millet restaurant 'cafe ethnic'. The Kerala Government has launched a 'millet village' scheme to promote the cultivation of millets such as ragi, bajra and maize by setting up a millet village at Attappady. The project aimed to protect the seeds of traditional millet varieties and to ensure food security and livelihood for tribals. "Mandua Jhangora Khayenge…Uttarakhand Rajya Banayenge": This slogan was popular during the separate state movement in Uttarakhand. The slogan itself proves that millets particularly Mandua[Finger Millet] and Jhangora[Barnyard Millet] have very special status in the life of people of the state. To integrate millets into modern food systems effectively, governments and non-government organizations must promote millet-based products through diverse public procurement programs, school feeding schemes, and awareness campaigns that highlight their health and environmental benefits [Shanker, 2024; Satyavathi and Bhat, 2024].

Suggestions

1. Millet procurement has to be increased by the Ministry of Food and Public Distribution under the TPDS, ICDS and Mid-Day Meal schemes.
2. While exploring the possibilities for millets export, the approach should be a two-way framework factoring the emerging trends and potential export countries. Policy interventions such as the inclusion of millets in RODTEP [Remission of Duties/Taxes on Export Products] scheme will aid in fueling the exports of millets.
3. A framework has to be set up to work on the refinement of the value chain for export markets, with the active involvement of stakeholders such as ICAR-IIMR, ICRISAT, NIN, IIFPT, DFRL, CFTRI, FPOs, NGOs, Private Companies etc.
4. Increasing the skill development programmes to further strengthen the millet value chain.
5. Increased involvement of FPOs and SHOs in millet acquisition, processing and marketing.
6. Organizing awareness programmes on the nutritional and health benefits of millets.
7. Providing input subsidies to the farmers for procuring the seeds and fertilizers to encourage millet cultivation.
8. Encouraging the millet start-up companies by single-window permissions and giving subsidies on millet processing equipment.
9. Establishing quality seed producing hubs will improve the millet yield.
10. Provision of Minimum supporting price [MSP] must be ensured for all millet varieties.

Conclusion:

In this current scenario with an exploding population, increased dependence on wheat and rice made the food, health and nutritional security uncertain. Due to their climatic resilience, drought resistance, short life span, efficient water use and low input requirement, millets are instrumental in ensuring food security. In developed and even developing countries, people are drawn towards consuming simple carbohydrates in the form of fast foods, carbonated drinks and processed foods because of their good appeal and taste. This has led to various health issues such as obesity, diabetes, hypertension, lack of resilience etc. Inclusion of millets in public nutrition programmes and food systems can significantly enhance food, health and nutritional security. Millets are nutritional treasures and substantial alternatives in achieving food security, nutritional adequacy, public health sustainability and resilience.

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