



Access the article online

Quick Response Code



www.jacjournal.org

DOI: <https://doi.org/10.51648/jac105>***Corresponding author**

Dr. Bishundayal Prasad Patel
Associate Editor
Journal of Ayurveda Campus
Email: drbishun@gmail.com

Submitted: 29.03.2023

Received: 18.04.2023

Revised: 10.05.2023

Accepted: 24.07.2023

Copyright: © The Author(s) 2023. This is an open access article under the CC BY NC license.



Millets: The Choice of Food in 21st Century

Bishundayal Prasad Patel,^{1*} Shiv Mangal Prasad,² Bijendra Shah³

^{1,3}Associate Editor, ²Editor in Chief; Journal of Ayurveda Campus, Kathmandu, Nepal

EDITORIAL

Background

The millets, commonly known as grain grasses belongs to Poaceae family and are a group of highly variable, small and round seeded herbaceous species indigenous to many areas of the globe. It is well adapted to grow under low soil fertility, low moisture, and hot environmental conditions; and have great value specially in semiarid regions because of their short growing season and higher productivity under hot and drought conditions. Often millets can be grown where maize and sorghum crops may fail. Some of millets such as Teffo or Fonio are prized for their taste and functionality in nondroughted years and can bring higher prices per bushel than the more common millets.¹ The grain and forage are valuable as food and feed resources in Africa, Nepal, India, Russia and China. Pearl millet is the most widely grown millet and is a very important crop in India,² Nepal and parts of Africa.³

As of 2021, India accounted for 41% of the world's millet production, with Niger and China following closely behind with 12% and ~8%, respectively. India comes up at number twelve among the nations that generate large amounts of millet. For ages, millet has been an essential component of our nutrition. They have several health advantages and are environmentally friendly due to their low production input and water requirements.⁴

The Government of India, Nepal and other nations co-proposed; and the United Nations General Assembly's 75th session and members of FAO governing bodies supported the International Year of Millets (2023). In order to promote millets as an essential part of the food basket, the international year of millets promises to offer a special chance to boost worldwide production, guarantee effective processing and consumption, encourage better crop rotation utilization, and foster improved connectivity throughout food systems.⁵

It aimed to link importance of millets with biodiversity, sustainability of food security and many health benefits including combating diabetes mellitus, cancer, cardiovascular conditions, decreasing tumour occurrence, lowering blood pressure, heart disease risk, cholesterol, and fat absorption rate, etc.

Climate Change and Millets

Millets are renowned for their climate-resilient qualities, which include their capacity to adapt to a wide range of ecological circumstances, reduced irrigation needs, improved growth and productivity in low-nutrient environments, reduced dependency on pesticides, and little susceptibility to environmental shocks. Due to their C₄ status, millets are able to absorb more CO₂ from the environment and create more assimilates through photosynthesis, even in situations where atmospheric CO₂ levels are higher.⁶

Origin

The millets originated in East and West Africa, Eurasia, India and China from wild seed stock.⁷ Fonio, perhaps the oldest of the millets, was grown throughout much of semi-arid West Africa.¹ Pearl millet is one of the earliest domesticated millets; carbonized grains have been found in sub-Saharan and West African sites inhabited 4000-5000 years ago.⁸ ⁹ Finger millet appeared in east Africa and India; the same time.^{10, 11} Both grain were introduced into other areas via trade routes as early as 4000 years ago.¹² Foxtail

and Proso millets originated in Eurasia and China that spread via trade routes to India and Africa around 2000 years ago; proso millet was used as a bread grain in Europe from the Bronze Age through medieval times.^{13,14} Teff originated in the uplands of Ethiopia, most likely from *Eragrostis pilosa*; carbonized seeds were found in the pyramids of Dassar.¹⁵ *Pennisetum glaucum* is commonly known as Pearl millet (Bajra, Cattail millet, Proso millet, Broomcorn millet, Hog millet, Common millet); and are abundantly found in Africa, India, China, Russian Federation and United States. *Eleusine coracana* is commonly known as Finger millet (Ragi, Bird's foot millet, African millet); and are found in Africa, India and China. *Setaria italica* is commonly known as Foxtail millet (Italian millet, German millet, Kangni); and are found in China, Near East, Europe. *Digitaria exilis* are commonly known as Fonio (Acha, Fundi, Hungry rice); and are found in West and North Africa. *Panicum sumatrense* and *P. polypodium* commonly known as Little millet (Sama) and are found in India, Nepal, Burma. *Eragrostis tef* is commonly known as Kodo millet (Varagu); and are found in East Africa and Ethiopia. *Echinochloa crusgalli* is commonly known as Japanese barnyard (Japanese millet, Barnyard millet or Sawa); and are found in Asia.

Non-Communicable Diseases

The World Health Organization identifies non-communicable diseases as a major public health concern and the leading cause of all deaths worldwide. Non-communicable diseases (NCDs) account for 74% of all fatalities globally and include diabetes, cancer, heart disease, stroke, and chronic lung disease. Low- and middle-income nations account for more than three-quarters of all NCD fatalities as well as 86% of the 17 million premature deaths; those that occur before a person reaches the age of 70.¹⁶ This multifaceted development is predicated on several major factors, including globalization, the expansion of supermarkets, the speed at which cities are urbanizing, and the move toward sedentary lifestyles. This last one results in obesity or overweight, which again fuels NCDs like high blood pressure, high cholesterol, and raised blood sugar.

According to the 2019 non-communicable Diseases (NCDs) Risk Factors STEPS Survey in Nepal, unhealthy behavior is still prevalent among Nepalese. Life-threatening illnesses like cardiovascular diseases, diabetes, cancer, and chronic respiratory diseases are largely caused by unhealthy behavior (risk factors) like smoking and drinking, eating poorly, not exercising, and metabolic risk factors like elevated blood glucose, blood pressure, blood cholesterol, and overweight/obesity.¹⁷ Nepal, a low-income country, in which two-thirds (66%) of annual deaths are attributable to NCDs.¹⁸

The World Health Assembly approved a significant new health objective in 2012: the 25 by 25 goal, which calls for a 25% decrease in preventable death from non-communicable diseases (NCDs) by 2025.¹⁹ In addition to physical activity and a non-smoking policy,

a high-quality diet that includes functional foods or ingredients is one of the most promising approaches to primary and secondary NCD prevention.²⁰

Ayurvedic and Contemporary Uses

Dhanya varga occurs the major component of daily diet of human being. This group of food items can be further categorized as *Shukadhanya* (represents fruits of the food items having attached spines), *Shimbi-shanya* (represents cereals ingredients) and *Shudra-dhanya* (Lesser important food ingredients). The millets belong to *Shudra-dhanya* under *Dhanya varga* in Ayurveda; and its importance for health has been described below;

Kodrava (*Paspalum scrobiculatum* Linn.; family Gramineae) is commonly known as Kodo millet or Koda millet; its seeds are *vatakaraka*, *grahi* and *pittakapha shamaka*; and sometimes exhibits dizziness when it is taken as food and foodstuffs. It mainly contains protein, carbohydrates, fat and fibers; and is considered to be good diet for diabetes patients in place of rice.²¹

Shyamaka (*Echinochloa frumentacea* Linn.; family Gramineae) is commonly known as Barnyard millet which seeds are foodstuffs for deprived or marginalized people. It mainly contains protein, carbohydrates, fat and fibers; and vitamin B₁ abundantly. It is *ruksha* (astringent), *shoshaka* (absorbent), *vatajanaka* and *kapha-pittahara*; and whole plants are used in constipation and *paittika vikara*.²² *Shyamaka* is useful for treatment of over nourishment. It is best diet for rheumatoid arthritis; and considered beneficial diet in diabetes.

Kangu (*Setaria italica* Linn.; family Gramineae) is commonly known as Foxtail millet which seeds are foodstuffs for deprived people in place of rice. It mainly contains protein, carbohydrates, fat and fibers and also possesses a poisonous glycoside. It is *guru* (heavy), *ruksha* (astringent), extremely *kaphanashaka*; and are used for fractures and *vrinhana* (datus-tissues); and also recommended in puerperal pain and *amavata* (rheumatoid arthritis).²³ It is a good source of magnesium which is good for heart and prevents diabetes.

Cheenaka (*Panicum miliaceum* Linn.; family Gramineae) is commonly known as Proso millet which is considered to be similar in properties and action to *Kangu*. It is especially used in sexually transmitted diseases.²⁴ It is nutritious gluten free crop and a good source of energy. Studies show that proso millet contains high iron and protein content than wheat or rice; and has high content of Vitamin B₃ (niacin) and hence used in Pellagra, a condition characterized by dementia, diarrhoea and dermatitis caused by deficiency of vitamin B₃.²⁵

Joorna (*Sorghum vulgare* Linn.; family Gramineae) is commonly known as Great millet which seeds are used as foodstuffs. It mainly contains protein, carbohydrates, fat and fibers. It has diuretic action and nutritive to malnutrition; specially in children. It has been reported to *Kapha-pittanashaka* and *Kledahara* (hypolipidemic).²⁶ The minerals in sorghum millets have been shown to offer potential

benefits in lowering blood pressure, the risk of cancer, diabetes, heart disease, tumor incidence, and absorption of cholesterol and fat. It also delay the emptying of the gastrointestinal tract and promote gastrointestinal health.²⁷

Bajra (*Pennisetum typhoideum* (Burm.) Stapf & Hubb.; family Poaceae) is called *Nali*, *Nalika* in Sanskrit and popularly known as pearl millet. It is said to be possessed *Madhura rasa* (Sweet in taste), *Ruksha* (dry) and *Laghu* (light) properties, *Ushna-veerya* (hot in potency), *Katu-vipaka* (pungentness; biotransformation) and is said to be vitiated *Vata* and *Pitta*.²⁸ It also acts as *Shleshmahara* (pacifies *Kapha dosha*). The other properties and actions described to *Nali* are *Balya* (strength promoting), *Durjara* (difficult for digestion), *Pumstvahara* (anti-aphrodisiac), *Vilekhana* (scarifying), *Baddhanisyanda* (dries up and accumulates the fluid tissues of the body).²⁹ Pearl millet has 300Kcal of energy, 9-13% protein, 5-8% fat and 62-70% starch. Maize, wheat, or sorghum, pearl millet grain has a comparatively higher energy density. The increased fat content in pearl millet is thought to be responsible for its higher energy density. Linolenic acid and polyunsaturated fats are also abundant in it. The minerals found in pearl millet are higher than those found in corn, including calcium, phosphorus, magnesium, manganese, zinc, iron, and copper. It is very nutritious due to its excellent *in vitro* pepsin digestibility values, favorable amino acid balance, and high concentration of essential amino acids.³⁰

Madhulika (*Eleusine coracana* (L.) Gaertn.; family Gramineae) is commonly known as Ragi, Ragi Kodhi and finger millets. Its' cooling nature helps to mitigate excess heat and acidity. Traditionally, it is described to use in *Jaloddara* (ascites), *Pandu* (anaemia), *Tridosha shamaka*; specially *Pittashamaka*.³¹ Finger millet (*Eleusine coracana*) contains high levels of calcium and polyphenols, which have a variety of beneficial functions. The finger millet ethanol extracts (FEs) had been shown an antihypertensive effect in spontaneously hypertensive rats (SHRs). FE supplementation improved the lipid profiles, including the triglyceride, total cholesterol, and low-density lipoprotein cholesterol levels, without deterioration in liver function. FEs are a potent antihypertensive nutraceutical for regulating the renin angiotensin system and simultaneously inhibiting oxidative stress.³² It is a nutritious food, rich in calcium, protein, amino acids, minerals and vitamins. Hence it is considered as beneficial diet for infants, geriatric individuals and pregnant women, lactating mothers for improving milk production, prevention of malnutrition and degenerative diseases. It increases hemoglobin.

Millets are often referred to as coarse grain or poor people's crops. Millets possess many health benefits and to manage chronic diseases. The magnesium content in millets contributes to promote healthy blood sugar level, reduces frequency and effects of migraine and heart attack. Studies shows that vitamin B₃ of millets reduce the cholesterol level and prevents cardiovascular diseases and obesity. Millets are gluten free and hence used in patients suffering from gluten sensitive

enteropathy. The phenolics content is helpful to prevent risk of cancer. Millets are good source of antioxidant and thus stimulate wound healing, prevents tissue damage and pre-aging symptoms; the insoluble fibres' content and anti-acidic property help to prevent gallstones, and relieves from gastric ulcer and constipation. Studies show that regular consumption of millets reduces the risk of asthma in childhood by 50%. Millets have lower glycemic index than rice. So millets can help to reduce the chance of diabetes, which is often associated with the risk of hypothyroidism.³³

Nepal

Millets are often an under rated crop, have been quietly nurturing and sustaining the people for the centuries. Compared to major cereal crops, millets stand tall with their superior nutritional value. For many small-scale farmers grappling with infertile, arid, or upland fields and no access to irrigation or inputs, millets have emerged as a vital food source. With climate change affecting agriculture across the nation, millets offer a sustainable solution to fortify nutrition and food security, while also safeguarding biodiversity.³⁴ The statistics of Ministry of Agriculture and Livestock Development indicates that 315,067 metric tons of millet were produced in 278,030 hectares of land in year 2022. The area used for millet cultivation has dropped to 265,401 hectares during the past ten years, a fall of 12,629 hectares.³⁵ Nepal boasts a rich diversity of millet types, including:

Finger Millet (*Kodo*): It is the 4th most important crop of Nepal after rice, maize and wheat in terms of area and production. The major production areas are mid-hills and high-hills, low in fertility and marginal lands in Nepal. The most common food prepared by it are thick porridge (locally known as *dhindo*) and other products are pancakes, roasted thick breads and fermented alcoholic beverages (*raksi*).³⁶

Proso Millet (*Chino*): It is the 2nd important millet in Nepal and grows in high lands districts such as Humla, Jumla, Dolpa. In light of the nation's changing environment, it is the crop of the future with tremendous potential for addressing food insecurity in rural regions. *Chino* is used for making *Bhat* (cooked like rice), *Kheer* (pudding) and *Raksi* (liquor). The flour can be used for making *Dhindo* (porridge) and *Roti* (pancake and flat bread).³⁷

Foxtail Millet (*Kaguno*): Foxtail millet (*Kaguno*) is the 3rd most important crop among the group of millets. Major foxtail millet growing districts are high lands where crop is grown sole as well as mixed with finger millet, proso millet, beans, amaranths and sorghum, etc. It is valued by mountain farmers for its nutritional content and health promoting properties. Cooked *Kaguno* is used as *Bhat* (cooked like rice), *Dhindo* (porridge), *Kheera* (like rice pudding) and sweets. It is also appreciated for medicinal benefits such as reducing blood glucose levels and cholesterol control in normal as well as diabetic patients.³⁸

Sorghum (*Junelo*): Sorghum is one of the four major food grains of the world. These days, it is being used as biofuel in developed

countries. It is cultivated in terrace bonds and used for food and fodder, and is a good source of iron, calcium and protein.³⁹ Sorghum is an endangered millet in Nepal. Elderly people and young toddlers with brittle teeth can consume it.

Pearl Millet (*Bajra*): Pearl millet grows in very limited to small areas in the Tarai and Lower hills. Pearl millet has superior nutritive value to sorghum but inferior feeding value. It makes bones strong; and is good for diabetic patients. Many healthy dishes like Dalia, Roti, Paratha, Sweets (*Laddu*); and Pancakes can be made from pearl millet.⁴⁰

Barnyard Millet (*Sama*): It is limited to western mid-hills; and is used as food for human consumption and feed for livestock and birds.⁴¹ It is rich in protein, Vit B-complex and helps in weight loss. *Sama* grain contains 6.2 percent protein, 9.8 percent crude fiber and 65.5 percent carbohydrates.³⁴

Kodo Millet (*Kodi*): *Kodi* is recommended as a substitute of rice for diabetic patients. Its straw is of poor quality and harmful to horses. It lowers cancer risk and reduces high blood pressure. *Kodi* contains 8.3 percent protein and 1.4 percent fat.⁴²

Buckwheat Millet (*Phafara/Kuttu*): Buckwheat is used to make *Dhindo*, a Nepalese popular food recipe marketed in restaurants of Kathmandu.⁴³ It lowers the blood pressure and is diabetic friendly. It is beneficial for cardiovascular diseases, and can be included in regular diet to loosen overweight. Additionally, buckwheat safeguards against gallstones, asthma in children and breast cancer.⁴⁴

Amaranth Millet (*Rajgira*): Amaranth also known as *Rajgira*, is a great source of protein and dietary fiber. It is excellent for a balanced diet. Additionally, this millet aids in preventing hair loss and greying. Amaranth also reduces cholesterol and the chance of developing cardiovascular disease. It contains a lot of calcium, vitamins and other nutrients.^{45, 46} Browntop millet (*Korle*), Little millet (*Moraiyo*) and others also grow in arid areas in different parts of Nepal and India which are also beneficial for health.

Common Food Recipes

Different recipes are prepared from millets. *Appalu* (a crispy snack prepared from pearl millet and Bengal gram), *Samaipayasam* (porridge/kheera), *Korramurukulu* (crispy savoury snack prepared from foxtail millet and Bengal gram flour) are some common food recipes in south India.⁴⁷ Millet Khichdi, Lemon millet, Millet pulao, Millet dosa, Ragi mudde, Ragi malt, Ragi cake, etc. are popular recipes in India.⁴⁸ Millet pizza, Millet burger, Millet biscuits, Millet macaroni, Millet pakoda, Millet momo and others are nowadays popular food items in Nepalese and Indian restaurants. Some of the millets are frequently used to prepare fermented beverages such as *Sur* (finger millet based fermented beverage), *Madua* (finger millet based fermented beverage), *Oshikundu* (fermented preparation from pearl millet, malted sorghum, bran and water) and *Koozh* (fermented millet flour and rice).⁴⁷

Food Interaction

Proso millet and other grains along with milk, curd, buttermilk, oil, etc. can cause Psoriasis.⁴⁹ Foxtail millets along with milk are mutually contradicted. Millets can't react with homeopathic medicines. It can be taken with supplements like multivitamin tablets or capsules, Omega 3 fatty acids products. It is better to consult general physician when one plan to include these products in his/her diets and taking with molecular medicines. In case of physician suggests to include in daily regimens, it is better to take molecular medicines first, and make a gap of 30 minutes; and then take the products.⁵⁰

Current Status and Future

The millets are a diverse group of Cereals that are generally grown in harsh environments or as early maturing crops. They are critically important food cereals for many people in Asia and Africa. Millets are used in numerous thick and thin porridges, fermented and unfermented breads, alcoholic and nonalcoholic beverages, steamed products, and snacks.

Millets have unique properties in the battle against diseases because of their high content of dietary fibers, antioxidants, minerals, phytochemicals, polyphenols, and proteins. Due to its significant role in nutritional security and possible rising health repercussions, millet is presently addressing an important area of research for medical and food scientists. By employing suitable and effective processing methods, millets' nutritious value can be significantly increased. It is imperative to develop millet-based government policies that recognize their contributions to achieving nutritional security and reintroduce them into agricultural production in order to create cropping systems that are climate resilient, given the many health and environmental benefits.

It's time for governmental and non-governmental groups to support millets and encourage their value addition through research, training, conferences, and seminars. Organic farming can fetch greater prices in domestic and foreign markets even with lower yields.

CONCLUSION

The millet varieties such as Kodo and Barnyard are the best for everyday usage. These days, finger, foxtail, and other types of millets are being popular due to their numerous applications in the global prevention of many chronic diseases. Therefore, millets in contemporary and *sudradhanya* in Ayurveda are beneficial to the world's population. Millets consume atmospheric carbon dioxide atmosphere at high rate for photosynthesis thus considering better to control environmental pollution. Thus, millets can be used to maintain nutritional requirement of individual, control non-communicable diseases, and mitigate environmental pollution in the 21st century.

Millets are the seeds of health, nutrition, clean environment and sustainability; they are more than simply grains.

REFERENCES

1. NRC. Lost Crops of Africa. Washington DC: National Academy press, National Research Council. 1996.
2. ICRISAT. Pearl millet in Indian agriculture. In: Harinarayana G, editor. Proceedings of the International Pearl Millet Workshop. Patancheru, Andhra Pradesh, India: ICRISAT.1987
3. Dako D. Amino Acid Composition and Biological Value of Cereal proteins. In: Lasztity R, Hidvegi M, editors. Cereal utilization in west Africa. Budapest, Hungary: D. Reidel Publishing Company.1983:27. DOI:10.1007/978-94-009-5307-9_2
4. IDI. Millet cultivation in India- History and trends. India Data Insight: IDR. 2023 [cited October 21, 2023]. Available from: <https://idronline.org/article/agriculture/millet-cultivation-history-and-trends/>
5. Chakraborty M, Debnath S. Millets: Food of the future. The Agriculture Magazine. 2023;2(3):170-3.
6. FAO. International Year of Millets 2023-Building momentum for the year [Internet]. United States: Food and Agriculture organization of United Nations.2022. [cited Oct 21, 2023]. Podcast. Available from: <https://media.un.org/en/asset/k1h/k1h0tqi7qq>
7. Vavilov N. The Origin, Variation, Immunity and Breeding of Cultivated Plants. Chronica Botanica Verdoorn F, editor. Waltham, MA: Chronica Botanica Co. 1951. DOI:10.1097/00010694-195112000-00018
8. ICRISAT. Pearl millet in Indian agriculture. In: Harinarayana G, editor. Proceedings of the International Pearl Millet Workshop. Patancheru, Andhra Pradesh, India: ICRISAT.1987
9. Brunken J, De Wet J, Harlan J. The morphology and domestication of pearl millet. Economic botany. 1977:163-74. DOI:10.1007/BF02866587
10. De Wet J, Rao KP, Brink D, Mengesha M. Systematics and evolution of Eleusine coracana (Gramineae). American journal of Botany. 1984;71(4):550-7. DOI:10.1002/j.1537-2197.1984.tb12540.x
11. Hilu KW, De Wet J. Domestication of Eleusine coracana. Economic Botany. 1976;30(3):199-208. DOI:10.1007/BF02909728
12. McDonough CM, Rooney LW, Serna-Saldivar SO. The millets. Food Science and Technology. New York: Marcel Dekker. 2000:177-202.
13. Marinval P. Archaeobotanical data on millets (*Panicum miliaceum* and *Setaria italica*) in France. Review of Palaeobotany and Palynology. 1992;73(1-4):259-70. DOI:10.1016/0034-6667(92)90062-L
14. Rachie KO, Majmudar JV. 'Pearl Millet'. University Park, PA: Pennsylvania State University Press. 1980.
15. Seyfu K. Production trends, germplasm resources, breeding and varietal improvement with special emphasis on Teff in Ethiopia. In: Seetharam A, Riley K, Garinarayana H, editors. Small Millet in Global Agriculture. New Delhi, India: Oxford and IGH Publishing Co. 1986:167-72.
16. WHO. Non-communicable diseases: Key facts. Zeneva, Switzerland: World Health Organization. 2023 [updated Sep 16, 2023; cited Nov, 2023]. Available from: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>.
17. WHO. Persistent high prevalence of non-communicable diseases risk factors in Nepal. Zeneva, Switzerland: World Health Organization. 2020 [updated Mar 17, 2020; cited Nov 2, 2023]. Available from: <https://www.who.int/nepal/news/detail/17-03-2020-persistent-high-prevalence-of-non-communicable-diseases-risk-factors-in-nepal>.
18. Bista B, Dhimal M, Bhattarai S, Neupane T, Xu YY, Pandey AR, et al. Prevalence of non-communicable diseases risk factors and their determinants: Results from STEPS survey 2019, Nepal. PloS one. 2021;16(7):e0253605. DOI:10.1371/journal.pone.0253605 PMID:34329300 PMCID:PMC8323895
19. Horton R. Non-communicable diseases: 2015 to 2025. The Lancet. 2013;381(9866):509-10. DOI:10.1016/S0140-6736(13)60100-2 PMID:23410603
20. Wagner KH, Brath H. A global view on the development of non communicable diseases. Preventive medicine. 2012;54:S38-S41. DOI:10.1016/j.ypmed.2011.11.012 PMID:22178469
21. Misra B. Kodrava-Kodo millets (*Paspalum scrobiculatum* Linn.; family Gramineae); Dhanya varga verse 80 with Hindi Commentary by Chunekar KC. In: Pandey GS, editor. Bhavaprakash Nighantu. Varanasi, India: Chaukhambha Orientalia. 2015:645.
22. Misra B. Shyamaka-Japanese Barnyard Millet (*Echinochloa frumentacea* Linn.; family Gramineae); Dhanya varga verse 79 with Hindi Commentary by Chunekar KC. In: Pandey GS, editor. Bhavaprakash Nighantu. Varanasi, India: Chaukhambha Orientalia. 2015:645.
23. Misra B. Kanguni-Foxtail millet (*Setaria italica* Linn.; family Gramineae); Dhanya varga verse 76-77 with Hindi Commentary by Chunekar KC. In: Pandey GS, editor. Bhavaprakash Nighantu. Varanasi, India: Chaukhambha Orientalia. 2015:644.
- 24.

25. Misra B. Chinaka-Indian millet (*Panicum miliaceum* Linn.; family Graminae); Dhanya varga verse 78 with Hindi Commentary by Chunekar KC. In: Pandey GS, editor. Bhavaprakash Nighantu. Varanasi, India: Chaukhambha Orientalia. 2015:644.
26. Nithyashree K, Vijayalaxmi K. Effect of Popping on Nutrients and Anti-nutrients in Proso Millet. *Mysore Journal of Agricultural Sciences*. 2022;56(4).
27. Misra B. Joorna-Great Millet (*Sorghum vulgare* Linn.; family Gramineae); Dhanya varga verse 87 with Hindi Commentary by Chunekar KC. In: Pandey GS, editor. Bhavaprakash Nighantu. Varanasi, India: Chaukhambha Orientalia. 2015:648.
28. Mathanghi S. Nutraceutical properties of great millet-*Sorghum vulgare*. *Int J Food Agric Veter Sci*. 2012;2(2):40-5.
29. Nrupa M. Nalika (*Pennisetum typhoides* Burm.; family Gramineae), verse 59, Karpuradi varga. Madanapala Nighantu. Bombay, India: Ganga Vishnu Sri Krishnadas. 1867:296.
30. Sharma PV. Vajraan (*Pennisetum typhoides* Burm.; family Gramineae). Priya Nighantu. 2nd ed. Varanasi, India: Choukamba surabharati prakashana. 1995:275.
31. Suma F, Urooj A. Impact of household processing methods on the nutritional characteristics of pearl millet (*Pennisetum typhoideum*): A review. *Journal of Food Processing and Technology*. 2017;4(1):28-32. DOI:10.15406/mojfpt.2017.04.00082
32. Agnivesa. Shukadhanya Varga (Class of Corn or Monocotyledons); Verse 14, Annapaana Bishayaka Varga Sangraha (Classification of Diets). In: Shastri RD, Upadhyaya Y, Pandey GS, Gupta B, Misra BD, editors. Charaka Samhita-Vidhyodani with Hindi Commentary by Pandey KN & Chaturvedi GN. Part I. Reprint ed. Varanasi (UP), India: Chaukhambha Bharati Academy. 2015:528.
33. Park SY, Jeong EW, Yang YS, Kim HJ, Go GW, Lee HG. Finger Millet Ethanol Extracts Prevent Hypertension by Inhibiting the Angiotensin-Converting Enzyme Level and Enhancing the Antioxidant Capacity in Spontaneously Hypertensive Rats. *Antioxidants (Basel)*. 2021;10(11). DOI:10.3390/antiox10111766 PMID:34829637 PMCID:PMC8614972
34. Sarita ES, Singh E. Potential of millets: nutrients composition and health benefits. *Journal of Scientific and Innovative Research*. 2016;5(2):46-50. DOI:10.31254/jsir.2016.5204
35. Oli T. Millets in Nepal: Nurturing sustainability, cultivating health. Kathmandu: The Annapurna Post. 2023 [updated Sep 14, 2023; cited Nov 2, 2023]. Available from: <https://theannapurnaexpress.com/story/45814/>.
36. NBA. Millet Farming Area Declines but Production is Rising: New Business Age. 2023 [Updated Jan 16, 2023; cited Nov 2, 2023]. Available from: <https://www.newbusinessage.com/Articles/view/16755>.
37. Bhandari B, Subedi A, Gyawali S, Baral K, Chowin K, Shrestha P, Sthapit B. Promoting Neglected and Underutilized Species in Nepal: A Case of Finger Millet. *Minor Millets in South Asia: Learnings from IFAD-NUS Project in India and Nepal*. 2010:147.
38. Joshi BK, Ojha P, Gauchan D, Ghimire KH et al. Nutritionally unique native crop landraces from mountain Nepal for geographical indication right. *Traditional Crop Biodiversity for Mountain Food and Nutrition Security in Nepal* (D Gauchan, BK Joshi, B Bhandari, HK Manandhar and DI Jarvis, eds) Tools and Research Results of UNEP GEF Local Crop Project, Nepal. 2020.
39. Regmi B, Kunwar S, Acharya TD, Gyawali P. Potential of Underutilized Grain Crops in the Western Mountains of Nepal for Food and Nutrient Security. *Agriculture*. 2023;13(7):1360. DOI:10.3390/agriculture13071360
40. Karki R. Study on the Preparation of Biscuit and Cake from Amaranthus and Sorghum. *Journal of Food Science and Technology Nepal*. 2016;9:79-84. DOI:10.3126/jfstn.v9i0.12172
41. Gyawali P. Production trend, constraints, and strategies for millet cultivation in Nepal: A study from review perspective. *International Journal of Agricultural and Applied Sciences*. 2021;2(1):30-40. DOI:10.52804/ijaas2021.213
42. Joshi T, Mainali RP, Bhandari S, Acharya P, Ghimire KH. Neglected and Underutilized Crop Species of Nepal: Smart Foods for Uncertain Future. *Agro-Biodiversity for Life and Environment*. 2023:187. DOI:10.3126/aej.v24i01.58189
43. Wikipedia. *Paspalum scrobiculatum*: The Wikipedia: The free Encyclopedia; [cited Nov 2, 2023]. Available from: https://en.wikipedia.org/wiki/Paspalum_scrobiculatum.
44. Khanal K. Dhindo, a Traditional Buckwheat Porridge, Gains Popularity at Kathmandu Restaurants [Internet]: Global Press Journal. 2017 [Updated Mar 30, 2017]. Available from: <https://globalpressjournal.com/asia/nepal/dhindo-traditional-buckwheat-porridge-gains-popularity-kathmandu-restaurants/>.
45. Singh A, Kumari A, Chaudhary HK. Amaranth, Buckwheat, and Chenopodium: The “ABC” Nutraceuticals of Northwestern Himalayas. *Agricultural Biotechnology: Latest Research and Trends*. 2021:587-634. DOI:10.1007/978-981-16-2339-4_26 PMCID:PMC9515677

46. Bhattarai G. Amaranth: a golden crop for future. Himalayan Journal of Science and Technology. 2018;2:108-16. DOI:[10.3126/hijost.v2i0.25854](https://doi.org/10.3126/hijost.v2i0.25854)
47. Rastogi A, Shukla S. Amaranth: a new millennium crop of nutraceutical values. Critical reviews in food science and nutrition. 2013;53(2):109-25. DOI:[10.1080/10408398.2010.517876](https://doi.org/10.1080/10408398.2010.517876) PMID:23072528
48. D'Souza R. Millet Recipes [Internet]: EasyAyurveda.com. 2023. Available from: <https://www.easyayurveda.com/2019/11/14/millets/>.
49. Swathi. Millet [Internet]: Swathi. 2022 [Updated Oct 1, 2022, cited Nov 2, 2023]. Available from: <https://www.indianhealthyrecipes.com/millet-khichdi-korra-khichdi-korra-biyyam-khichdi/>.
50. Krishnamurthy M. Psoriasis: Ayurvedic Treatment, Medicines, Herbs, Remedies [Internet]: EasyAyurveda.com. 2023. Available from: <https://www.easyayurveda.com/?s=Psoriasis>.
51. D'Souza R. Millets [Internet]. India: EasyAyurveda.com. 2021. Available from: https://www.easyayurveda.com/2019/11/14/millets/#finger_millet_%e2%80%93_ragi_benefits.

How to Cite

Patel BP, Prasad SM, Shah B. Millets: The Choice of Food in 21st Century. Journal of Ayurveda Campus.2023;4(1):1-7.