Millets: Smart Nutritive Food

Ronika[1], Vedna Kumari[2], Avnee[3]*and Ranbir Singh Rana[4]
[1]Ph.D. Scholar, Department of Genetics and Plant Breeding, CSK HPKV Palampur
[2]Principal Scientist, Department of Genetics and Plant Breeding, CSK HPKV Palampur
Ph.D. Scholar, Department of Agronomy, CSK HPKV Palampur
[3]Principal Scientist, Department of Agronomy, CSK HPKV Palampur
***Corresponding author: avneemandial@gmail.com**

Malnutrition is a major public health problem worldwide associated with micronutrient deficiencies (especially iron, zinc and vitamin-A) which leads to poor health and reduced productivity. Millets have been touted as a potential solution to malnutrition due to its nutritional profile, drought tolerance, climate resilience, affordability and sustainability. They are a group of small-seeded cereal crops that are grown primarily for food in developing countries like India. These are among the earliest food known to humans and may have been the first cereal grain to be used for domestic purposes. Due to their ability to grow in subpar soils and dry environments, these crops are crucial sources of food in regions that are prone to drought and food insecurity. Some common types of millets in the country include pearl millet, sorghum, foxtail millet, proso millet, finger millet, little millet, barnyard millet and kodo millet (Fig 1). Both major and minor millets are good sources of nutrients, including protein, fiber, vitamins and minerals (Table 1).Additionally, millets are non-glutinous, contain a higher level of fiber and have low glycemic index compared to other staple cereals, making them a good option for people with gluten intolerance or who are looking for a healthier food option.Taking into account the crop's importance both nationally and globally, the United Nations has designated 2023 as 'The International Year of Millets' to highlight the significance of millets as a food source, their potential to enhance food security and nutrition and to promote sustainable agriculture.

Despite all nutrients, millets contain various anti-nutritional factors that bind to the nutrients in the food and reduce their bioavailability for utilization by the human body. The main anti-nutrients found in millets include phytic acid, tannins, polyphenols and enzyme inhibitors. Phytic acid can bind to minerals such as calcium, iron and zinc, making them less available for absorption. Tannins can hinder the digestion of proteins, carbohydrates; and enzyme inhibitors interfere with the digestion of certain enzymes. Polyphenols are considered vital for life nonetheless; they show an inhibitory effect on iron absorption and restrict the growth of beneficial microbes in the body. However, mitigating strategies such as soaking (12 to18 hrs in water for reducing the levels of soluble phytic acid and enzyme inhibitors), sprouting, decortication (dehulling), germination, heating and fermentation (improves antioxidant properties, protein digestion and helps in detoxification) of millets can reduce the levels of anti-nutrients and enhance their nutritional value.

Fig 1: Most common millets grown in India

Anti-nutrients and strategies to mitigate

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Role in climate resilience

Millets are known for their adaptability to a range of environmental conditions, such as drought, high temperatures and poor soils. This adaptability makes millets an ideal crop for areas that are vulnerable to climate change impacts. Millets are adapted to water deficit conditions and also have high water use efficiency thus, help in soil moisture conservation. Additionally, the carbon footprints of millets are comparatively lower than cereals indicating less greenhouse gas emission. Millets are an essential component of traditional agricultural system and are often grown in mixed cropping systems with other crops. This diversity helps to maintain soil health, reduce the risk of crop failure and support the resilience of the ecosystem thereby help to improve food security in areas that experience more frequent and intense weather extremes.

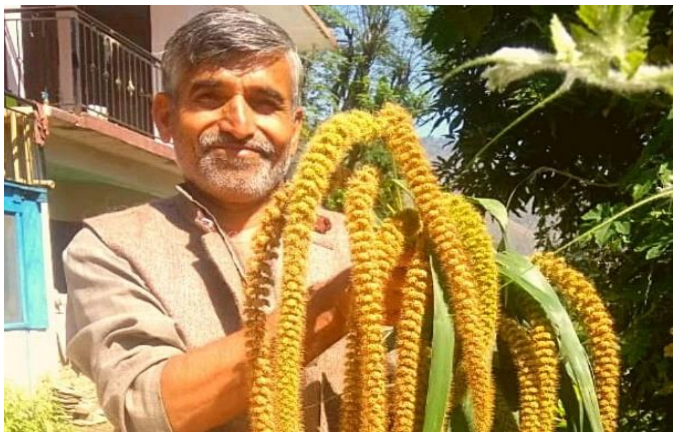
Processed products of millets

Processing has the potential to enhance farmer's income by adding significant value to the agricultural produce. Several value-added products of millets such as muffins, cookies, chapati, upma, noodles etc. (Fig 2) are available in the market and gaining the attention of economically rich and health-concerned masses of society.

Fig 2: Processed products of millets

Success story

Nekram Sharma is an organic farmer from district Mandi, Himachal Pradesh who is reviving the traditional crop system of *nau anaj*which is a natural intercropping method of growing nine foodgrains on same piece of land without any



chemical usage and cutting down water usage by 50% along with raising land fertility. He is producing local indigenous seeds and distributing it to 10,000 farmers in six states at no cost. The 59years old farmer has got the prestigious Padma Shri award in 2023for his distinguished service in the field of agriculture. These crops are a combination ofmaize, moong, beans, rajmash, urd bean, amaranths, foxtail millet, finger millet and buckwheat.

Conclusion

While there is a great potential for millets to play an important role in addressing malnutrition, their impact depends on a range of factors, including local agro-ecological conditions, the availability of high-quality seed and other inputs and the extent to which they are incorporated into the diets of communities. Besides, it will be important to ensure that the promotion of millets does not come at the expense of other nutritious and culturally-important foods.

Table 1: Quality traits and varieties released of major and minor millets

Millets	Scientific name	Chromosome no.	Varieties released (2014-21)	Quality trait
Major millets				
Sorghum	*Sorghum bicolor*	2n=2x=20	43	Known as 'camel crop' High in carbohydrates
Pearl millet	*Pennisetum glaucum*	2n=2x=14	52	High iron content
Minor millets				
Foxtail	*Setaria italica*	2n=2x=18	8	High in proteins, carbohydrates and minerals such as copper and iron
Finger millet	*Eleusine coracana*	2n=4x=36	28	Very high amount of calcium, high in fibre, powerhouse of proteins and amino acids
Proso millet	*Panicum miliaceum*	2n=4x=36	4	High protein content, well adapted to dry sandy soils
Barnyard millet	*Echinochloa esculenta*	2n=6x=36	4	High in fibre, carbohydrates,phosphorus and iron
Little millet	*Panicum sumatrense*	2n=4x=36	11	High iron and fibre content, reduce fat deposition in body
Kodo millet	*Paspalum scrobiculatum*	2n=4x=40	4	Digestion-friendlymillet, rich in phytochemicals, phytate and minerals

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