



Review article

Millets as nutritional, ecological and economic food security

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ABSTRACT

Millets are cultivated around the world and are considered staple food in some parts of the world. They comprise grasses that are small-seeded and are considered powerhouses of nutrition. In Asia and Africa, millet consumption is high compared to other parts of the world. Millets are very important as they provide good nutritional support to overall health; hence, they are considered potent nutritional supplements. Today, the health industry is flourishing worldwide by introducing concepts of nutritional well-being because millets are gluten-free and comprise all important micro as well as macro nutrients that are crucial for overall health. Millets are very rich in complex carbohydrates, fiber, protein, vitamins, and minerals and are low in fat. Millets also have a low glycemic index, thus offering an ideal food opportunity in maintaining overall health in diabetic patients as well. In recent studies, it has been found that the regular introduction of millets into our diet can lower the risk of several chronic diseases, such as cardiovascular diseases, various lifestyle disorders, gut health issues, and several allergies. Millets help in reducing cholesterol levels and improving blood glucose control. Millets are also a good source of antioxidants, which can protect against oxidative stress and inflammation, hence helping in boosting immunity.

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INTRODUCTION

Trinadhanya is made up of two words, *trin* and *dhanaya*. In Sanskrit, this means small-seeded grains that grow wild. These seeds do not need any cultivation. The explanation of millets is widely described in various Ayurvedic texts, including Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya. In Ayurveda, these millets have been described as *Kudhanya* (inferior among cereals), *Kshudr dhanya* (small-sized cereals) and *Trina dhanya* (grass-derived cereals).

In Charaka Samhita, the properties of millets have been described as *laghu* and *madhura* (Acharya, 2009). They are termed as *vata pitta nashaka*. The properties of *trinadhanaya* are described as *kashaya* and *madhur rasa*, which means they are astringent and sweet in taste. It has *laghu* and *ruksha guna*, which is understood as light in digestion and dry. The *Virya* of *trinadhanaya* has been explained as *sheeta*, that is cold in potency. *Vipaka* is *katu*, which means its biotransformation will be pungent in taste.

In Sushruta Samhita's 46th chapter, *kudhanya varga* is explained in *Annapanavidhi Adhayaya*. Different *vargas* have been explained as *koradushaka*, *syamaka*, *nivara*, *santanu*, *varaka*, *uddhalaka*, *priyangu*, *maddhulika*, *nandimukhi*, *kuruvvinda*, *gavedhuka*, *sara*, *baruka*, *todaparni*, *mukundaka*, and *venuyava* (Acharya, 2001).

Acharya Vagbhatta explained millets in the Ashtanga Hridaya *Sutrasthana*, 6th chapter, *Annaswaroop Vijnaniya Adhyaya*. Different *vargas* are explained in this chapter, namely, *kangu*, *kodrava*, *nivara*, *syamaka*, *priyangu*, *yava*, *godhuma* and *nandimukhi* (Paradkar, 2002).

In Bhavprakash Nighantu, millet explanations are given in *Purvakhanda*, which is *dhanya varga*. These include *kangu*, *cinaka*, *syamaka*, *kodrava*, *caruka*, *vamsayava*, *kusumbhabija*, *govedhuka*, *nivara*, and *yavanala*. Overall, Ayurvedic texts recommend using millets as part of a balanced diet to maintain dietary habits and as a permanent solution for dietary disorders.

In the present work, we have conducted a comprehensive literature review on *Trina dhanya*, also known as millets. Millets are a group of small-seeded grasses that have been cultivated for centuries and are known for their nutritional benefits. We have gathered information from classical texts, research articles, websites, and publications from institutions like IIMR (Indian Institute of Millets Research), and hence gathered a diverse range of perspectives and data to write this article.

2023 AS INTERNATIONAL YEAR OF MILLETS

The United Nations General Assembly has officially designated the year 2023 as the International Year of

Millets. The core objective of this program is to heighten awareness and encourage people worldwide to engage in the cultivation and promotion of millets. This initiative stems from the recognition that millets bring substantial nutritive value and possess the versatility to thrive in harsh climatic conditions, presenting a valuable alternative to other cereals.

The emphasis on cultivating millets is driven by their nutritional richness and their adaptability to challenging environmental conditions. Millets are recognized not only for their nutritional contributions but also for their resilience in adverse climates, making them a practical choice for sustainable agriculture.

By designating 2023 as the International Year of Millets, the United Nations aims to inspire a global movement that fosters awareness about the benefits of millet cultivation. This includes their nutritional value, environmental sustainability, and potential as a viable substitute for other cereal crops. The program seeks to promote widespread understanding of millets' positive impact on agriculture, nutrition, and food security (FSSAI, 2023).

QUALITIES OF MILLETS

Indians have been using millets since ancient times due to their high nutritional value (Kumar et al., 2018). Many other factors contribute to their high utility, as listed below.

- i. Millets needs very less water for their cultivation. They can sustain in severe drought conditions also. While compared to other cereals, millets are known to have less water consumption.
- ii. Although millets are known about their benefits but they are also well tolerated to various pests and various. This helps in minimal burden over the cultivating farmer.
- iii. The growing period of millets as compared to other cereals is less and their maturity also occur maximum within 100 days.
- iv. Millets are having high nutritive value as they are rich in various phytochemicals and micronutrients. Millets are alkaline forming grains thus helps in maintaining the pH of the human body.
- v. Millets are gluten free and thus they are highly recommended to those who are having gastrointestinal issues.

PHARMACODYNAMICS OR RASAPANCHAKA OF MILLETS

<i>Rasa:</i>	<i>Kasaya, Madhura rasa</i>
<i>Guna:</i>	<i>Lagu, Ruksha</i>
<i>Veerya:</i>	<i>Sheeta</i>
<i>Vipaka:</i>	<i>Katu</i>
<i>Karma:</i>	<i>Lekhana, Vrishaya, Kledashoshana, Baddhamalakara</i>

DIFFERENT TYPES OF MILLETS IN AYURVEDA

Ayurveda, the ancient Indian system of medicine, considers millets to be a healthy food that provides many

health benefits (Morya et al., 2017). Different types of millets are used in Ayurveda, mainly including:

Foxtail Millet (Kangni)

In Ayurveda, it is named as Kandu or Priyangu. It is *vata vardhaka* and *kapha nashaka*, aiding in the healing of fractures. Rich in protein, zinc, and calcium, it is beneficial for ailments related to the intestine and stomach. Its botanical name is *Setaria italica* or *Panicum italicum* Linn., and the family is Poaceae.

Finger Millet (Ragi)

Explained by Acharya Susruta, it is described as *madhura* in *rasa*, *sita* in *virya*, and having *snigdha guna*. Acting as *Brihmana* and *balakaraka*, it reduces blood-related disorders due to its *sita* potency. Its botanical name is *Eleusine coracana*, and the family is Poaceae.

Pearl Millet (Bajra)

Rich in protein, fiber, iron, magnesium, and phosphorus, it is believed to have *ushna guna*, providing warming properties. It has *vilekhana* and drying properties. Its botanical name is *Pennisetum glaucum* Linn. or *Cenchrus americanus*, and the family is Poaceae.

Barnyard Millet (Jhangora/Sawa/Sanwa)

Also known as *Syamaka*, it is comprised of *sita virya* and *laghu guna*. It is *vata vardhaka* and *kapha pitta shamaka*. According to Astanga Hridaya, it is *malabaddha nashaka* and *avashoshaka*, relieving constipation and absorbing excess water (Tripathi, 1996). It is a gluten-free millet, rich in fiber, protein, calcium, and phosphorus, helping reduce inflammation. Its botanical name is *Panicum frumentaceum* Linn., and the family is Poaceae.

Barley (Jau/Yava)

According to Acharaya Vagbhata, yava has *madhur rasa*, *rooksha guru guna*, and *sita virya*. It is laxative and *vata shamaka*, with *tridoshanashaka* properties. Its botanical name is *Hordeum vulgare*, and the family is Poaceae.

Little Millet (Kutki)

A small, gluten-free millet rich in protein, dietary fiber, calcium, and magnesium. It is believed to have cooling properties and is often used in Ayurvedic preparations for digestive disorders. Its botanical name is *Panicum sumatrense* Linn., and the family is Poaceae.

Proso Millet (Cheena Millet)

This millet does the *brihana karma* and is *bhagnasandhankara*, promoting strength and having healing properties associated with bone fractures and bone health. It is *laghu* and *ushana* in nature. Its botanical name is *Panicum miliaceum* Linn., and the family is Poaceae.

Kodo Millet (Kodrava)

Sangrahi and possessing *deepana* property, it is beneficial in *shoola*, *mootrakrucchra*, and *raktapitta*. It helps balance *vata* and *pitta dosha*. Its botanical name is *Paspalum scrobiculatum* Linn., and the family is Poaceae.

Sorghum Millet (Jowar)

Pitta kapha shamaka, having *madhur* and *kashaya rasa*, *sheeta* in potency. It is used in conditions like *raktapitta*. It is *trishnaghna* and *vrushaya* in nature. Its botanical name is *Sorghum bicolor* or *Sorghum vulgare* Linn., and the family is Poaceae.

USE OF MILLETS IN DIFFERENT DISEASE

Diabetes

Millets have a high fiber content, which helps in lowering blood glucose levels along with glycosylated hemoglobin. This means they regulate blood sugar levels, making them an ideal food for people with diabetes.

Cardiovascular diseases

Millets are rich in antioxidants and have been shown to reduce the risk of cardiovascular disease by lowering cholesterol levels and blood pressure, primarily due to low-density lipoproteins.

Gastrointestinal issues

Millets are high in both soluble and insoluble fiber and are gluten-free, promoting healthy digestion and preventing constipation. They are easily digested and offer a much healthier option for patients with celiac disease. Millets help regulate bowel movements, relieving constipation and promoting good gut health.

Immunity booster

Millets enhance the immune system as they are rich in various nutrients like phenolic compounds, which help remove free radicals and reduce oxidative stress.

Eye sight

Millets are abundant in beta-carotene, especially the darker varieties. Due to this, they are known to be a good source of vitamin A, which is essential for maintaining good eye health.

DISCUSSION

By analyzing the above-mentioned qualities of millets, it is understood that they can be wisely used in diseases that originate due to the vitiation of the *kapha dosha* and *pittaja dosha*. In patients with *vata dosha* vitiation, millets should not be used as they can aggravate the condition. Millets are also considered good for *Raktadushti*.

Various indications of millets, as per Ayurvedic texts, include *sthoulaya*, *kusta*, *prmeha*, *atisara*, *medoroga*,

vrana, and various lifestyle disorders. Hence, it is concluded that millets are very useful in *santarpanajanya vikara*. In Ayurveda, various *pathya klpana* are mentioned, which are beneficial to the patient. Millets are becoming a part of the preventive diet in healthy people and are acting as a good option for a therapeutic diet in diseased persons.

CONCLUSION

Our health is determined by the food we eat. Nowadays, people are involved in a sedentary lifestyle. This condition is badly affected by the fast-food industry, which is flourishing all over the world. This has resulted in various lifestyle-related disorders, which are effectively cured by the usage of millets. By understanding the qualities of millets, they can be used wisely in *kaphaja*, *pittaja*, and *raktaja* disorders. In *vataja* disorders, millets should be used cautiously.

To get the maximum benefits from millets, they should be used according to the *ahar vidhi vishesha ayatana*. Millets help in reducing inflammation and increasing immunity along with lowering the glycemic index. Nowadays, these are the major health issues people are suffering from, so millets are an excellent option to combat such conditions. Ayurveda also recommends using millets appropriately according to *prakruti*, *dosha*, *bala*, etc., to get their maximum benefits.

Foods that are fiber-free are not good for gut health. Millets, with their high amount of fibers, contribute to the good health of the person and are very helpful in metabolic disorders. They help in the bone development in children due to their high content of calcium. Even, they are highly recommended in anemia because of the good iron content in them. So, it is concluded that to maintain optimum health, we should include millets in our diet so that we can utilize them wisely.

CONFLICTS OF INTEREST

The author(s) declare(s) no conflicts of interest.

DECLARATION

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