

Nutraceutically Important Millets

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Introduction

Sustainable crop substitutes are needed to meet the world hunger and to improve income of farmers. Role of millets cannot be ignored for achieving sustainable means for nutritional security. Millets are regarded as heritage crops owing to their cultivation and use as a staple food since ancient times in several parts of the world, especially India. Millets are group of small grained cereal food crops which are highly tolerant to drought and other extreme weather conditions and are grown with low chemical inputs such as fertilizers and pesticides. Most of millet crops are native of India and are popularly known as Nutri- cereals as they provide most of the nutrients required for normal functioning of human body. Millets are classified into major millets, minor millets and pseudo millets based on their grain size. Pseudo millets are so called because they are not part of the Poaceae botanical family, to which 'true' grains belong, however they are nutritionally similar and used in similar ways to 'true' grains. There are nine types of Millets grown in India. The major millets are Sorghum, Pearl Millet and Finger Millet covering 95% of the total millet growing area in India and the rest 5% are Little Millet, Foxtail Millet, Barnyard Millet, Proso Millet, Kodo Millet, and Browntop Millet. Due to the richness of millets in polyphenoles and other biological active compounds, they are also considered to impart role in lowering rate of fat absorption, slow release of sugars (low glycaemic index) and thus reducing risk of heart disease, diabetes and high blood pressure. Millets contain 7-12% protein, 2-5% fat, 65-75% carbohydrates and 15-20% dietary fibre. Millets help us stay hydrated in the colon, which prevents constipation. Millet is rich in niacin, which helps your body manage more than 400 enzyme reactions. Niacin is also important for healthy skin and organ function. In fact, it's such an important compound that it's often added to processed foods to enrich them. the potential of millets for managing and reducing diabetes. The low glyceimic index of millets is helping to manage diabetes. Finger Millet known as Ragi has the highest Calcium content of about 364 mg per 100 gm of



grains. It is 3 times more Calcium than milk. This Calcium dense grain keeps the bones and teeth strong. Millets are rich in dietary fiber and help in digestion and prevent constipation. Kodo Millet contains high dietary fiber that is 3 times more than wheat and maize and 10 times more than rice. The high fiber content in millets acts as pre-biotics and thus helps to maintain a healthy gut microbiome. Millets are absolutely gluten-free and it is good for celiac patients. Millets are rich in antioxidants which protect our cells from free radicals. A recent study showed that millets can reduce the risk of developing cardiovascular diseases. Millets help in weight loss. The specific content of millets like dietary fiber, Policosnols, and Tryptophan helps in weight loss. Millet, especially the darker varieties, is also an excellent source of beta-carotene. This natural pigment acts as both an antioxidant and as a precursor to vitamin A, helping your body fight off free radicals and supporting the health of your eyes. Millets can provide nutritious grain as well as fodder, but these can also very well fit into multiple cropping systems under irrigation as well as dryland farming due to their short growing season. Millets cultivation can be a solution to this problem as these can grow on shallow, low fertile soils with a pH of soil ranging from acidic 4.5 to basic soils with pH of 8.0. Millets can be a good alternative to wheat especially on acidic soils. Rice is very sensitive to saline soils and has poor growth and yield on a soil having salinity higher than 3ds/m. On the other hand, millets like pearl millet and finger millet can grow up to a soil salinity of 11-12 ds/m. Milles have a low water requirement both in terms of the growing period and overall water requirement during growth. The rainfall requirement of certain millets like pearl millet and proso millet is as low as 20cm, which is several folds lower than the rice, which requires an average rainfall of 120-140 cm. Most of the millets mature in 60-90 days after sowing which makes them a water saving crop.

Barnyard millet has the least maturation time of 45-70days among millets, which is half to the rice maturation time. Millets fall under the group of C4 cereals. C4 cereals take more carbon dioxide from the atmosphere and convert it to oxygen, have high efficiency of water use, require low input and hence are more environment friendly. Thus, millets can help to phase out climatic uncertainties, reducing atmospheric carbon dioxide, and can contribute in mitigating the climate change. Millets require only one-third of the water required by rice, wheat, maize and sugarcane crops. Millet is rich in niacin, which helps your body manage more



than 400 enzyme reactions. Niacin is also important for healthy skin and organ function. In fact, it's such an important compound that it's often added to processed foods to enrich them.

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Millets are cultivated in low-fertile land, tribal and rain-fed and mountainous areas. Millets are generally grown in these areas include Himachal Pradesh, Haryana, Uttar Pradesh, Chhattisgarh, Gujarat, Rajasthan, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Telangana. Apart from health benefits, millets are resilient to climate change as they are adapted to a wide range of temperatures, and moisture regimes, and demand less input to grow. They are hardy crops that have low carbon & water footprints. It can sustain drought and even 350-400 mm of rainfall is sufficient for millets. Millets grow faster, putting less stress on the environment. The United Nations General Assembly adopted a resolution declaring 2023 as the International Year of Millets, as proposed by India to the Food and Agriculture Organization and the primary aim of this initiative is to increase the awareness of millets' health benefits among the people and their suitability for cultivation under tough conditions marked by climate change.

Major Millets

1. Pearl Millet

- Pearl Millet (Bajra) is a popular grain in North-West India, including Rajasthan and Haryana, Maharashtra, Uttar Pradesh and Gujarat.
- Pearl millet contains considerably high proportion of proteins (12-16%) as well as (4-6%)
- It contains 11.5% of dietary fiber. It increase transit time of food in the gut and reduce risk of inflammatory bowel disease.
- The niacin content in pearl millet is higher than all other cereals.
- It is rich in calcium and unsaturated fats which are good for health.
- Being rich in iron, pearl millets are ideal for kids and women who suffer from anaemia or iron deficiency.
- It can be consumed as Multigrain *dalia*, bajra flakes with honey and bajra *roti*.



2. Finger Millet

- Finger Millet is popularly known as *nachni* and *ragi*, has multiple macronutrients and micronutrients such as Vitamin B3, folate and calcium.
- It is also high in calcium and has healthy concentrations of iron and other minerals as well.
- Ragi also has a good number of essential amino acids essential for the human body in the antioxidant activity of traditional Indian foods.
- The grains have excellent malting properties and are widely known for its use as weaning foods.
- Finger millets are quite popular in Karnataka, Maharashtra, Uttarakhand, Himachal Pradesh, Tamil Nadu, Andhra Pradesh, Jharkhand, Odisha, Chhattisgarh and Gujarat.



3. Sorghum Millet

- This is also another popular type of Millet in India to make Rotis and other bread.
- It is locally known as Jowar.
- Jowar is a rich source of iron, protein, thiamine, riboflavin, folic acid and fibre. Jowar also has more antioxidants than blueberries and pomegranates and is rich in calories and macronutrients.

- It is rich in potassium, phosphorus and calcium with sufficient amounts of iron, zinc and sodium.
- Sorghum, commonly known as *jowar*, is popularly consumed in Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh and Tamil Nadu.
- Jowar is blessed with copper, magnesium, and calcium which keeps the bones and tissues strong adding to better immunity.
- It keeps the heart healthy by lowering LDL (bad cholesterol) and reduces the chances of a stroke.



Minor Millets

4. Foxtail Millet

- The Foxtail millet, also known as Kangni, is a grain well-known for promoting good cardiac health and maintaining good hair and skin. It can be used in Dosas, cheelas and more.
- Foxtail Millet, also known as Kakum/Kangni in India, is usually available in Semolina or rice flour. It is high in carbohydrates
- It has double quantity of protein content compared to rice and also contain copper and iron.
- It has sweet nutty flavour and is considered to be one of the most digestible and non-allergic grains.
- They can help lower blood sugar levels thus aiding in diabetes management. Foxtail millets are rich in calcium and iron, which helps strengthen bones and muscles.
- Foxtail Millet are usually found in Andhra Pradesh, Karnataka, Telangana, Rajasthan, Maharashtra, Tamil Nadu, Madhya Pradesh and Uttar Pradesh.



5. Proso Millet

- It is popularly known as *chena* in Hindi, proso millet is more popular in southern India -- Tamil Nadu, Karnataka and Andhra Pradesh, Uttarakhand.
- Broomcorn helps balance blood sugar levels as it has a low glycemic index.
- It contains high amount of calcium which is essential for bone growth and maintenance.
- It reduces cholesterol level and also reduce the risk of heart diseases.
- It is a good option for diabetics to be incorporated into a daily diet.
- It helps stimulate the nervous system and maintain its smooth functioning.
- It also has anti-aging properties, hence regular consumption can also help delay ageing.



6. Barnyard Millet

- Barnyard millet is a gluten-free source of both insoluble and soluble fibres.
- It is richest source of crude fibre and iron.
- Barnyard millets are regularly consumed in Tamil Nadu, Andhra Pradesh, Karnataka and Uttarakhand regions of India.
- It is ideal for those on a weight loss diet since it is low in calories, while also being high in iron and aiding to those with anaemia.



7. Kodo Millet

- Rich in fibre and iron, the Kodo millet grain helps prevent constipation and control blood sugar.
- Kodo Millet, also known as Kodon Millet, is a digestible variant with higher amounts of lecithin amino acid.
- It has a significant effect on strengthening the nervous system.
- Kodo is a fantastic source of B vitamins, especially niacin, B6, and folic acid, among other vitamins and minerals.
- Kodo does wonders to post-menopausal women who suffer from high cholesterol or blood pressure levels.
- It contains calcium, iron, potassium, magnesium, and zinc minerals.
- Kodo millet is grown in Madhya Pradesh, Chhattisgarh, Maharashtra, Tamil Nadu and Karnataka and consumed as mysore millet *dosa*, Kodo millet *kheer*.
- It is consumed as Multigrain *dosa*, jowar flakes with honey and almond or jowar *khichdi*.



8. Little Millet (Moraiyo/Kutki/Shavan/Sama)

- Little Millet is smaller than other millets, also called Moraiyo, Kutki, Shavan, and Sama.
- It has high iron content and high antioxidant activities and is largely used in Southern states of India in numerous traditional dishes.

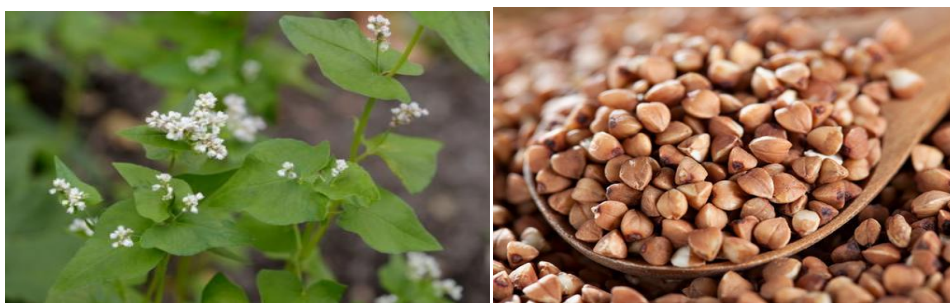
- It is a healthier alternative to rice and does not cause weight gain.
- Its potent antioxidants are useful in protecting you against diabetes, cancer, cataract and gastrointestinal problems.
- It is consumed as *dosa*, *khichdi*, *upma*.



Pseudo Millets

9. Buckwheat Millet aka *Kuttu*

- Buckwheat, also known as Kuttu in India, is one of the most common types of Millet and is often used during the Navratra fasting time.
- It contains 13-15% protein and is rich in amino acid lysine.
- It is diabetic-friendly and helps in reducing blood pressure. It is helpful for good cardiovascular health,
- Buckwheat also protects against cancer of the breast, asthma in children, and gallstones.



10. Amaranth

- Amaranth is known as Ramdana, Rajgira and Chola.
- Amaranth is a rich source of protein content (13-14%) and phytosterols with cholesterol lowering properties.
- Amaranth consists of 6-9% of oil which is higher than most cereals. Amaranth oil contains approximately 77% unsaturated fatty acids and is high in linoleic acid.

- High in iron, magnesium, phosphorus, potassium and appreciable amounts of calcium.
- Amaranth is very popular in Kerala, Tamil Nadu, Karnataka, Maharashtra, Andhra Pradesh and Telangana.

**Conclusion:**

Millets are highly nutritious, non-glutinous and non-acid forming foods. Hence they are soothing and easy to digest. They are regarded as the least allergic and most easily absorbed grains on the market. The demand for processed and convenience foods has dramatically expanded as a result of urbanisation, an increase in health awareness, and urban residents' increasing purchasing power. Millets are far less expensive, but they need to be thoroughly treated before being used. Approximately 50 million Indians have diabetes, 15% of Indians are obese, and India is the 128th-worst country for malnutrition. Therefore, it is important to spread awareness of the nutritional and health benefits of millet in order to promote consumption of millet and millet-based foods and prevent the spread of diseases and malnutrition.

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