

## Millets: A Nutri-cereals Solution for Food and Nutritional Challenge

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### SUMMARY

Millets are a group of highly variable small seeded grasses, widely grown around the world as cereal crops or grains for fodder and human food. Millets have a significant role in the traditional diets of many regions throughout the country. Millets have various advantageous properties like drought resistant, good yielding in areas where water is limited and they possess good nutritive values. The millets are categorized as major and minor millets, including sorghum, pearl and finger millet, while proso, barnyard, kodo, little and foxtail millets come under minor millets. Millets as climate change compliant crops score highly over other grains like wheat and rice in terms of marginal growing conditions and high nutritional value. These are nutri-cereals abode vitamins, minerals, essential fatty acids, phyto-chemicals and antioxidants that can help to eradicate the plethora of nutritional deficiency diseases. Millets cultivation can keep dry lands productive and ensure future food and nutritional security.

### INTRODUCTION

Millets belong to minor cereals in the grass family Poaceae. Millets are cereal crops grasses with small-seeded structures planted in diverse tropical and desert climates with the capacity to thrive in less rich soil (Shobana *et al.*, 2013). Millets have various advantageous properties like drought resistant, good yielding in areas where water is limited and they possess good nutritive values. These are mainly categorized into two categories: Major millets and minor millets. Sorghum, pearl and finger millet or ragi are major millets, while kodo, barnyard, proso, tiny, and foxtail millet are minor millets. Compared to many other crops, millets can produce much higher yields on minimal soils with low fertility and low input farming techniques and have the potency to be a saviour for the world's increasing population, hunger, and food shortages. Millets foods and beverages have functional and health-promoting effects, specifically anti-diabetic, anti-obesity, cardiovascular disease, due to the actions of phytochemicals and play a role in body immune system.



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 have a low water requirement both in terms of the growing period and overall water requirement during growth. Millets fall under the group of C<sub>4</sub> cereals. C<sub>4</sub> 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 environments friendly. Thus, millets can help to

phase out climatic uncertainties, reducing atmospheric carbon dioxide, and can contribute in mitigating the climate change.

### Nutrient Composition

The millet grain contains about 65% carbohydrate, a high proportion of which is in the form of non-starchy polysaccharides and dietary fibre which help in prevention of constipation, lowering of blood cholesterol and slow release of glucose to the blood stream during digestion. Lower incidence of cardiovascular diseases, duodenal ulcer and hyperglycemia (diabetes) are reported among regular millet consumers. Millet grains are also rich in important vitamins viz., Thiamine, riboflavin, folic acid and niacin. Millets are comparable to rice and wheat or rich in some of the minerals as well as fatty acids. Millets vary largely in composition of carbohydrates as proportion of amylose and amylopectin content vary from 16-28% and 72-84%, respectively.

### Millets and their significance in nutritional and health benefits

#### 1) Sorghum (*Sorghum bicolor* L.)

Sorghum is one of the most significant cereal crops among all millets, and it is more nutritious than other cereals such as rice and wheat (Ratnavathi and Komala, 2016). Sorghum is an excellent source of nutrients, vitamins such as riboflavin, niacin, and thiamin, high amount of magnesium, copper, iron, phosphorous, calcium, and potassium. The iron, copper and magnesium help in increase the iron absorption in the body. This reduces the chances of anemia that is led by iron deficiency. It provides dietary fiber by 48% of the recommended daily value. Sorghum possess vitamin B6 is essential for to hinder pain, depression, anxiety and fatigue. This shows that Vitamin B6 helps to prevent mood disorders and raise mood. In addition, sorghum is high in antioxidants like flavonoids, phenolic acids, and tannins. Eating a diet rich in these antioxidants can lower oxidative stress and inflammation in your body.



#### 2) Pearl millets (*Pennisetum glaucum* L.)

Pearl Millet, commonly known as bajra is a profoundly nutritious and easy to digest cereal grain. Pearl millets contains high amount of iron, zinc, magnesium, copper, manganese, potassium and phosphorous. Protein content in pearl millet is higher and it is also a good source of vitamin-B, Vitamin-A, folic acid, calcium and magnesium. Pearl millet grain has high fat content than other cereal cause poor keeping quality of the product. The chemical composition of pearl millet along with other traditional cereal crops is given in.

Pearl millet is helpful to patients with diabetes as it has a relatively low glycemic index that helps to digest gradually and produce glucose at a slower rate than other foods. This can sustain long periods of stable blood sugar levels. Pearl millet grain contains phenolic compounds in pericarp and grain testa, in particular flavonoids, which inhibit tumor production. It is high in iron and zinc content which may help in increasing HB and also preventing from anemia disease. Pearl millet grain is gluten-free, and it is one of the alternatives for the patients who have celiac diseases to consume a gluten free diet for a normal and healthy lifestyle



(Jukanti et al. 2016). Pearl millet has a large amount of phosphorus. Phosphorus is very essential for bone growth and development as well as for development of ATP which is the energy currency of our body (Malik, 2015). The pearl millet lignin and phytonutrients serve as good antioxidants and thus prevent heart related diseases. For this reason, pearl millet is considered good for cardiac health (Dayakar Rao et. al., 2017).

### 3) Finger millet (*Eleusine coracana* L.)

Finger Millet is one among the most nutritious cereals and is a good source of natural calcium which helps for bone strengthening and helps in reducing the risk of bone fractures. It is also a good source of natural iron helping in Anaemia. Finger Millet is considered as a good nutritious food which can be replaced in place of rice or wheat. It is considered as store house of nutrients rich in proteins, amino acids, minerals and vitamins. With its rich fibre content, it is a good laxative and helps to prevent constipation. Finger millet is a good for infants, elderly and pregnant women due to its high calcium content. It is also very good for lactating women as it helps in producing sufficient breast milk. Finger millet helps in different disease condition like blood pressure, heart problems, asthma and is very good food for diabetes where it helps in slow digestion and slow release of glucose in blood. Finger millet helps to increase the haemoglobin level and helps to fight malnutrition and degenerative diseases (O. S. K. Reddy, 2017).



### 4) Little Millet (*Panicum sumatrense*)

Little millet is highly nutrition and may be called little but it not less in its nutritional content. It is good source of B-vitamin, minerals like calcium, iron, zinc, potassium among others. It also provides essential fats to the body, the kind that helps in weight loss. The millet protein has a well-balanced amino acid profile and a good source of methionine, cystine, and lycine. These essential amino acids are of special benefit to those who depend on plant food for their protein nourishment. Its high fiber content is yet another positive making it an ideal part of pongal or even kheer instead of rice. Finger Millet grains are also rich in important vitamins viz., Thiamine, riboflavin, folic, and niacin. (O. S. K. Reddy, 2017).



### 5) Proso millet (*Panicum miliaceum* L.)

Proso millet, also known as broomcorn millet, common millet, hog millet, and Russian millet, Proso millet, as well as barnyard, kodo, tiny, finger, and foxtail millets, is used as a substantial nutritional component in a range of traditional dishes and drinks, such as bread, porridges, and snack foods, while grains given to animals such as pigs, fowls, and cage birds. Despite providing one-third of protein and energy in developing countries, proso millet is underused, with birdseed companies holding most of the market share (Das et al., 2019).



Proso millet is beneficial in preventing Pellagra condition, which is caused due to the niacin Vitamin B3. Proso millet has high content of Niacin. Pellagra is a skin disease which causes the skin to become dry, scaly and rough. Proso millet consists of protein and niacin (Vitamin B3). Traditionally it is used as recuperative food, especially post pregnancy or illness.

#### 6) Foxtail millet (*Setaria italica* L.)

Foxtail millets are rich in iron and calcium, both are crucial for muscle and bone wellness. Foxtail millet possess amino acids such as lecithin, methionine which lowers cholesterol by detaching excess fat in the liver and Tryptophan plentiful in Foxtail millet, is vital for avoiding feelings of hunger. Threonine precludes fatty liver, reducing bad cholesterol yet further. Foxtail millet helps in steady release of glucose without affecting the metabolism of the body. When people consume foxtail millet, the prevalence of diabetes is reduced and it is also known as healthy heart food due to its good source of magnesium (O. S. K. Reddy, 2017).



#### 7) Kodo millet (*Paspalum scrobiculatum*)

Kodo millet is also known as cow grass, rice grass, ditch millet, Native Paspalum. Kodo millet are traditional food which closely resembles the rice and helps to use in weight loss. It is easily digestible and is rich in phytochemicals and antioxidants which helps in preventing different lifestyle related diseases. Kodo millet also helps in reducing the joints and knee pain and helps in regularizing the menstruation in woman (Deshpande *et al.*, 2015).



### CONCLUSIONS

Millets can easily thrive in extreme conditions like drought, and some wild varieties can even prevail in flooded areas and swampy grounds. These have low glycaemic index, abode gluten-free protein and are rich in minerals (calcium, iron, copper, magnesium, etc.), B-vitamins and antioxidants. These extraordinary traits make them nutritious and climate change compliant crops. These can not only serve as an income crop for farmers but also improve the health of the community as a whole. Existing limitations, i.e., the presence of anti-nutritional factors and low sensory acceptability of millet-based products, can be overcome by the scientific interventions. The anti-nutritional factors can be inactivated by processing methods like cooking, roasting, germination and fermentation. The use of millets in commercial/packaged food will encourage farmers to grow millets and will open new opportunities and revitalize the farmers. The inclusion of millet-based foods in international, national and state-level feeding programs will help to overcome the existing nutrient deficiencies of protein, calcium and iron in developing countries.

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