Millets: Power House of Nutrition and Energy

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Millets are small-seeded grasses that are hardy and grow well in dry zones as rain-fed crops under marginal conditions of soil fertility and moisture. They are possibly the first cereal grain to be used for domestic purposes, the commonly grown millets are Sorghum, Pearl Millet, Finger Millet, Barnyard Millet, Foxtail Millet, Kodo Millet, Proso Millet and Little Millet. Unlike rice and wheat that require many inputs in terms of fertiliser and water, millets grow well in dry regions as rain-fed crops. Highly nutritious, non-glutinous and rich in fibre, they are easy to digest.

With advantages loaded in its favour such as low-maintenance, disease and pest resistance, nutritional benefits, market demand, fodder value and ecological benefits, millet is being considered as a smart crop. Known as C4 crops, millets are highly efficient in absorbing and using carbon dioxide. Most varieties of millets are well known for their hardiness and have the capacity to withstand prolonged periods of drought, high temperatures and still produce grains and fodder.

United Nations declared the Year 2023 as the International Year of Millets on 5th March 2021, on the proposal moved by India and supported by 72 countries. It is essential to give such honour to the traditional wisdom of humanity. These are the first plants to be domesticated for food. On 6th December 2022, the Food and Agriculture Organization (FAO) of the United Nations organised an opening ceremony for the **International Year of Millets** (IYM) 2023 in Rome, Italy. The revival of millet cultivation in the southern provinces of Karnataka, Andhra Pradesh and Telengana, agronomics say, is a step towards sustainable cropping practices that respects biodiversity in nature.

Table 1: Miilets with Scientific name

Millet	**Scientific name**
Pearl Millet	*Pennisetum glaucum*.L.
Sorghum	*Sorghum bicolor*
Finger Millet	*Eleusine coracana*
Small Millets:	
Foxtail Millet	*Setaria italica*
Barnyard Millet	*Echinochloa frumentacea*
Kodo Millet	*Paspalum scrobiculatum*
Proso Millet	*Panicum miliaceum* L.
Little Millet	*Panicum sumatrense*
Two Pseudo Millets:	
Buck wheat(Kuttu)	*Fagopyrum esculentum*
Amaranthus (Chaulai)	*Amaranthus viridis*

Pearl Millet (Bajra)

Pearl millet (*Pennisetum glaucum*, *P. typhoides, P. tyhpideum, and P. americanum*) is the most extensively cultivated millet and characterized by

English : Pearl Millet
Hindi : Bajra
Bengali : Bajra
Gujarati : Bajri
Kannada : Sajje
Marathi : Bajri
Oriya : Bajra
Punjabi : Bajra
Tamil : Kambu
Telugu : Sajja

large stem, leaves, and condensed panicles (spike) of

10 to 150 cm in length.It has the highest yield potential of all millets

Table 2: Pearl Millet Nutrient per 100g

Energy (Kcal)	361
Protein	11.6 g
Carbohydrate	65.5 g
Crude Fiber	1.2 g
Calcium	42mg
Iron	8.0 mg

- ✓ Reduce the risk of diabetes & cardio vascular diseases
- ✓ Beneficial in treating and prevention of gallstones and stomach ulcers
- ✓ Nutritionally dense and reduce anaemia, liver disorder and asthma
- ✓ It's hypo allergic properties help prevent allergic reactions
- ✓ Relieves constipation
- ✓ Lowers blood glucose response and reduce the risk of Type II diabetes
- ✓ Rich in anti-oxidants and hence reduce oxidative stress
- ✓ Reduce the risk of cancer
- ✓ Reduce the occurrence of Hypertension

Pearl millet is found to be beneficial in the process of weight loss due to its high fibre content and ability to prolong satiety. It has been found that due to its high fibre content it reduces the risk of occurrence of gall stone It is also a rich source of calcium and phosphorus which helps to attain peak bone density.

Sorghum (Jowar)

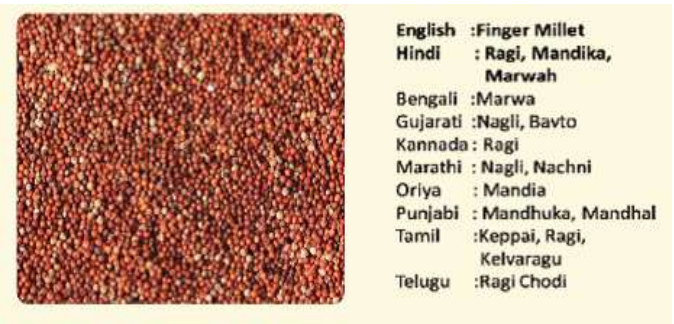
Sorghum (*Sorghum bicolor L.*) commonly known as the "King of millets', is a highly productive crop plant, which can be used for grains, livestock feed or industrial purposes.

Table 3: Sorghum Nutrient per 100g

Energy (Kcal)	349
Protein	10.4 g
Carbohydrate	72.6 g
Crude Fiber	1.6 g
Calcium	25mg
Iron	4.1 mg

Sorghum and their products have high nutritional value and showed antioxidant, anti-obesity, anti-diabetic, anti-cardiovascular, anti-inflammatory, antimicrobial and anticancer activities. However, sorghum have some limitations due to the presence of some anti-nutritional factors such as tannins, phytates, trypsin inhibitors, and protein crosslinker. Technological processing such as soaking, germination, fermentation, thermal processes, irradiation, and others are suitable ways for removing or reducinganti-nutritional factors, improving sorghum quality, and producing foods with high nutritional value.

Finger Millet (Ragi)



Finger millet (*Eleusine coracana*), often known as ragi in India, stands unique among the cereals such as barley, rye and oats with higher nutritional contents and has outstanding properties as a

subsistence food crop. It is rich in calcium, dietary fiber, phytates (0.48%), protein, minerals and phenolics. It is also a rich source of thiamine, riboflavin, iron, methionine, isoleucine, leucine, phenylalanine and other essential amino acids. The abundance of these phytochemicals enhances the nutraceutical potential of finger millet, making it a powerhouse of health benefiting nutrients. It has distinguished health beneficial properties, such as anti-diabetic, anti-diarrheal, antiulcer, anti-inflammatory, antitumerogenic, atherosclerogenic effects, antimicrobial and antioxidant properties.

Table 4: Finger Millet Nutrient per 100g

Energy (Kcal)	328
Protein	7.3 g
Carbohydrate	72 g
Crude Fiber	2.6 g
Calcium	344mg
Iron	8.9 mg

Foxtail Millet

Foxtail millet (*Setaria italica* L.) an annual grass plant, produces seeds that possess health-promoting properties owing to its unique protein composition containing a high content of essential amino acids. It is one of the earliest cultivated crops, extensively grown in the arid and semiarid regions of Asia and Africa, as well as in some other economically developed countries of the world where it is more commonly used as bird feed. Antinutrients like phytic acid and tannin present in this millet can be reduced to undetectable amounts by using the proper processing methods. Additionally, the millet is said to have antioxidant, low-glycemic index, and hypolipidemic properties.

Table 5: Foxtail millet nutrient per 100g

Energy (Kcal)	331
Protein	12.30 g
Carbohydrate	60.9 g
Crude Fiber	14.0 g
Calcium	31.00 mg
Iron	3.6 mg

Barnyard Millet

Barnyard millet (*Echinochloa crusgalli, E. colona*), is a short duration crop that can grow in adverse environmental conditions with almost no input and can withstand various biotic and abiotic stresses. In addition to these agronomic advantages, the grains are valued for their high nutritional value and lower expense as compared to major cereals like rice, wheat, and maize. It contains a rich source of protein, carbohydrates, fiber, and, most notably, micronutrients like iron (Fe) and zinc (Zn) that are related to numerous health benefits. All these features make barnyard millet an ideal supplementary crop for subsistence farmers and also as an alternate crop during the failure of monsoons in rice/major crop cultivating areas.

Table 6: Barnyard millet nutrient per 100g

Energy (Kcal)	341
Protein	7.7 g
Carbohydrate	67.0 g

Crude Fiber	7.6 g
Calcium	17.00 mg
Iron	9.3 mg

Kodo Millet

In India, Kodo millet (*Paspalum scrobiculatum*) grown mostly in the Deccan region and the cultivation extends to the foothills of Himalayas. Kodo millet is rich in dietary fiber and minerals like iron,antioxidant. The phosphorus content in kodo millet is lower than any other millet and its antioxidant potential is much higher than any other millet and major cereals, higher amount of antioxidants helps against oxidative stress and maintain glucose concentrations in type-2 diabetes. Kodo millet is useful in curing asthma, migraine, blood pressure, heart attack and atherosclerosis, diabetic heart disease and for postmenopausal in women.

Table 7: Kodo millet nutrient per 100g

Energy (Kcal)	302
Protein	08.03 g
Carbohydrate	69.9 g
Crude Fiber	8.5 g
Calcium	22.00 mg
Iron	9.9 mg

Proso Millet

Proso-millet (*Panicum miliaceum L.*) is an underutilized crop which is highly nutritious cereal grain used for human consumption, bird seed, and/or ethanol production. Grains of proso millet are a rich source of vitamins (niacin, B-complex vitamins, folic acid), minerals (P, Ca, Zn, Fe) and essential amino acids (methionine and cysteine), starch, and phenolic compounds like antioxidants and betaglucans. Seeds also contain components with healing benefits, which decrease the level of low-density lipoprotein cholesterol in blood and injury to the liver and high lecithin content which supports the neural health system.

- It contains the highest amount of proteins (12.5%).
- Health benefits of proso millet come from its unique properties. It has significant amounts of carbohydrate and fatty acids.
- It is cheaper source of manganese as compared to other conventional sources like spices and nuts.
- It contains high amounts of calcium which is essential for bone growth and maintenance.
- It reduces cholesterol levels and also reduce the risk of heart diseases

Table 8: Proso millet nutrient per 100g

Energy (Kcal)	309
Protein	08.03 g
Carbohydrate	65.90 g
Crude Fiber	9.0 g
Calcium	27.00 mg
Iron	0.50 mg

Little Millet

English : Little Millet
Hindi : Kutki, Shavan
Bengali : Sama
Gujarati : Gajro, Kuri
Kannada : Same, Save
Marathi : Sava, Halvi, Vari
Oriya : Suan
Punjabi : Swank
Tamil : Samai
Telugu : Samalu

Little Millet (*Panicum miliare*) is one among the minor millets grown to a limited extent all over India up to altitudes of 2100 m. It is a relative of proso millet but the seeds of little millet are much smaller than proso millet. With their low carbohydrate content, slow digestibility and low water-soluble gum content. The complex carbohydrates, phenolic compounds, antioxidant content present in them helps to prevent metabolic disorders like diabetes, cancer, obesity etc.

- It is smaller than other millets.
- It is high in iron content.
- It has high antioxidant activities.
- It contains about 38% of dietary fiber.

Table 9: Little millet nutrient per 100g

Energy (Kcal)	314
Protein	10.13 g
Carbohydrate	65.55 g
Crude Fiber	7.72 g
Calcium	32.00 mg
Iron	1.30 mg

Amaranth (Ramdana/ Rajgira)

- High protein content (13-14%) and a carrier of lysine, an amono acid that's missing or negligible in many other grains.
- Consists of 6 to 9% of oil which is higher than most other cereals. Amaranth oil contains approximately 77% unsaturated fatty acids and is high in linoleic acid.
- It is high in dietary fibre.
- High in iron,magnesium, phosphorus, potassium and appreciable amounts of calcium.
- A rich dietary source of phytosteriols, with cholesterol - lowering properties.

English : Amaranth Seed, black
Hindi : Ramdana, Rajgira
Bengali : Amaratba bīja
Gujarati : Rajgaro
Kannada : Danthu beeja
Marathi : Cavali biya
Oriya : Kosala sag manji Dhala
Punjabi : Chaulai beej
Tamil : Keerai vidai
Telugu : Thotakoora ginjalu

- Contains a lunasin - like peptide and other bioactive peptides which are thought to have cancer - preventive and antihypertensive properties.

Table 10: Amaranth nutrient per 100g

Energy (Kcal)	125.5
Protein	4.7 g
Carbohydrate	23 g
Crude Fiber	2.6 g
Iron	2.6 mg
Magnesium	80 mg

Buckwheat (Kuttu)

English : Buckwheat
Hindi : Kuttu
Bengali : Bā'ikavāṭa
Gujarati : Biyāṁ sāṭhēnō dāṇō
Kannada : Huruḷi
Marathi : Baṭaravhīṭa
Oriya : .....
Punjabi : Bā'ikavāṭa
Tamil : .....
Telugu : Bukvīṭ

- It contains protein 13-15% protein and rich in the amino acid lysine.

- Rich in carbohydrates (mainly starch).
- Contains vitamins B1, C and E.
- Rich in polyunsaturated essential fatty acids, such as linoleic acid.
- Contains higher levels of zinc, copper, and manganese than other cereal grains, and the bioavailability of these minerals is also quite high.
- High in soluble fibre.
- A rich source of polyphenol compounds.
- Contains rutin, a bioflavonoid thought to help control blood pressure and possess anti - inflammatory and anti - carcinogenic properties.

Table 11: Buckwheat nutrient per 100g

Energy (Kcal)	118
Protein	04.3 g
Carbohydrate	21.3 g
Crude Fiber	2.1 g
Magnesium	65 mg

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