

Millets, The 'Nutri-Cereals' that could fillup to Mission Nutrition

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Introduction

Millets are small-grained cereals that are grown with little input mostly under unfavourable agricultural situations. These crops are primarily originated in Africa and Eurasia and later domesticated in several different countries. They constitute an important staple in the semi-arid tropics and ensure food and nutritional security for the poor people, who cannot cultivate



other major food crops due to low rainfall and poor soil fertility. Millets are climate resilient crops, and they may play an important role in reducing greenhouse emission by mitigating emission of nitrous oxide (N₂O) into the environment. Millets are traditional grains, grown and consumed in the Indian subcontinent from the past more than 5000 years. Millets are small - grained, annual, warm weather cereals belonging to family gramineae. They are rainfed, hardy grains which have low requirements of water and fertility when compared to other popular cereals. They are highly tolerant to drought and other extreme climatic conditions.

Millets are nutri cereals comprising of sorghum, pearl millet, finger millet (Major millets) foxtail, little, kodo, proso and barnyard millet (minor millets). These are one of the oldest foods known to humanity. These are one of the several species of coarse cereal grasses in the family poaceae, cultivated for their small edible seeds. 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.

Millets are highly nutritious, non-glutinous and non-acid forming foods. Millets have many nutraceutical and health promoting properties especially the high fibre content. Millets act as a probiotic feeding for micro - flora in our inner ecosystem. Millets hydrate our colon to keep us from being constipated. Niacin in millet can help lower cholesterol. Millets contain major and minor nutrients in good amount along with dietary fibre. Millets are gluten free and can be a substitute for wheat or gluten containing grains for celiac patients.

Nutritional Composition of various types of Millets with their Local Name

Millets are high in nutrition and dietary fibre. They serve as good source of protein, micronutrients and phytochemicals. The millets contain 7-12% protein, 2-5% fat, 65-75% carbohydrates and 15-20% dietary fibre. The essential amino acid profile of the millet protein is better than various cereals such as maize. Millets contain fewer cross-linked prolamins, which may be an additional factor contributing to higher digestibility of the millet proteins.

Similar to cereal proteins, the millet proteins are poor sources of lysine, but they complement well with lysine - rich vegetables (leguminous) and animal proteins which form nutritionally balanced composites of high biological value. Millets are more nutritious compared to fine cereals. Small millets are good source of phosphorous and iron.

Millet Types and Name In Different Languages

English	Pearl Millet	Finger Millet	Foxtail Millet	Kodo Millet	Little Millet	Barnyard Millet	Sorghum
Scientific	<i>Pennisetum glaucum</i>	<i>Eleusine coracana</i>	<i>Setaria italica</i>	<i>Paspalum scrobiculatum</i>	<i>Panicum sumatrense</i>	<i>Echinochloa spp.</i>	<i>Sorghum bicolor</i>
Oriya	Bajra	Mandia	Kanghu/ Kangam/ Kora	Kodua	Suan Gurji	Khira	Juara

Hindi	Bajra	Nachani/ Mundua/ Mandika/ Marwah	Kangni/ Kakum/ Rala	Koden/ Kodra	Kutki/ Shavan	Jhangora/ Sanwa	Jowar
Tamil	Kambu	Kezhvarag u/Kelvara gu/Keppai / Ragi	Thinai	Varagu	Saamai	Kuthiraval i (Kuthiraiv olly)	Cholam
Telugu	Sajjalu	Ragula/ Ragi Chodi	Korra	Arikelu/ Arika	Sama/ Samalu	Udalu, Kodisama	Jonna
Kannada	Sajje	Ragi	Navane	Harka	Saame/Sa ve	Oodalu	Jola
Malayalam	Kambam	Panji Pullu	Thina	Koovarag u	Chama	Kavadapul lu	Cholam
Marathi	Bajri	Nagli/Nac hni	Kang/Rala	Kodra	Sava/Halvi /Vari	-	Jowari/ Jondhala
Punjabi	Bajra	Mandhuk a/Mandha l	Kangni	Kodra	Swank	Swank	Jowar
Gujarati	Bajri	Nagli/Bavt o	Kang	Kodra	Gajro/Kuri	-	Jowari/ Juar
Bengali	Bajra	Marwa	Kaon	Kodo	Sama	Shyama	Jowar

Millets Nutritional Facts

Crop / Nutrient	Protein (g)	Fat (g)	Fiber (g)	Minerals (g)	Iron (mg)	Calcium (mg)	Calories (kcal)
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Pearl Millet	10.6	4.8	1.3	2.3	16.9	38	378
<i>Pennisetum glaucum</i>							
Finger Millet	7.3	1.5	3.6	2.7	3.9	344	336
<i>Eleusine coracana</i>							
Foxtail Millet	12.3	4	8	3.3	2.8	31	473
<i>Setaria italica</i>							
Kodo Millet	8.3	3.6	9	2.6	0.5	27	309
<i>Paspalum scrobiculatum</i>							
Little Millet	7.7	5.2	7.6	1.5	9.3	17	207
<i>Panicum sumatrense</i>							
Barnyard Millet	11.2	3.9	10.1	4.4	15.2	11	342
<i>Echinochloa spp.</i>							
Sorghum	10.4	3.1	2	1.6	5.4	25	329
<i>Sorghum bicolor</i>							
Proso Millet	12.5	2.9	2.2	1.9	0.8	14	356
<i>Panicum miliaceum</i>							

Major Millets

Sorghum (Jowar)

- Major portion of sorghum protein is prolamin (kaffirin) which has a unique feature of lowering digestibility upon cooking which might be a health benefit for certain dietary groups.
- Sorghum proteins upon cooking are significantly less digestible than other cereal proteins, which might be a health benefit for certain dietary groups.



- It is rich in protein, fibre, thiamine, riboflavin, folic acid, and carotene.
- It is rich in potassium, phosphorus and calcium with sufficient amounts of iron, zinc and sodium

Pearl Millet (Bajra)

- Pearl millet contains considerably high proportion of proteins (12-16%) as well as lipids (4-6%).
- It contains 11.5% of dietary fibre. It increases transit time of food in the gut. Hence, reduce risk of inflammatory bowel disease.
- The niacin content in pearl millet is higher than all other cereals.
- It also contains foliate, magnesium, iron, copper, zinc and vitamins E and B- complex. It has high energy content compared to other millets.
- It is also rich in calcium and unsaturated fats which are good for health.



Finger Millet (Ragi)

- Finger millet is the richest source of calcium (300-350 mg/100g)
- Ragi has the highest mineral content.
- It contains lower levels of protein (6-8%) and fat (1.5-2%)
- Finger millet proteins are unique because of the sulphur rich amino acid contents.
- The grains have excellent malting properties and are widely known for its use as weaning foods.
- It has high antioxidant activity.



Minor Millets

Foxtail millet (Kakum)

- It is high in carbohydrates.
- It has double quantity of protein content compared to rice.
- It contains minerals such as copper & iron.
- It provides a host of nutrients, has a sweet nutty flavour and is considered to be one of the most digestible and non - allergic grains.



Kodo millets (Kodon)

- It has high protein content (11%), low fat (4.2%) and very high fibre content (14.3%).
- Kodo millet is rich in B vitamins especially niacin, pyridoxin and folic acid as well as the minerals such as calcium, iron, potassium, magnesium and zinc.
- It contains a high amount of lecithin and is an excellent for strengthening the nervous system.



Barnyard millet (Sanwa)

- It is the richest source of crude fiber and iron.
- Its grains possess other functional constituents i.e., Gamma amino butyric acid (GABA) and Beta - glucan, used as antioxidants and in reducing blood lipid levels.



Little millet (Kutki/Shavan)

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

Proso millet (Chenna/Barri)

- 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



Benefits of millet

Millet is rich in nutrients and plant compounds.

Therefore, it may offer multiple health benefits.

Rich in antioxidants

Millet is rich in phenolic compounds, especially ferulic acid and catechins. These molecules act as antioxidants to protect your body from harmful oxidative stress. Studies in mice link ferulic acid to rapid wound healing, skin protection, and anti-inflammatory properties. Meanwhile, catechins bind to heavy metals in your bloodstream to prevent metal poisoning. While all millet varieties contain antioxidants, those with a darker colour — such as finger, proso, and foxtail millet — have more than their white or yellow counterparts.

May help control blood sugar levels

Millet is rich in fibre and non-starchy polysaccharides, two types of undigestible carbs that help control blood sugar levels. This cereal also has a low glycemic index (GI), meaning that it's unlikely to spike your blood sugar levels. Thus, millets are considered an ideal grain for people with diabetes. For instance, a study in 105 people with type 2 diabetes determined that replacing a rice-based breakfast with a millet-based one lowered blood sugar levels after the meal. A 12-week study in 64 people with prediabetes gave similar results. After eating 1/3 cup (50 grams) of foxtail millet per day, they experienced a slight reduction in fasting and post-meal blood sugar levels, as well as a decrease in insulin resistance. Insulin resistance is a marker for type 2 diabetes. It occurs when your body stops responding to the hormone insulin, which helps regulate blood sugar. What's more, in a 6-week study in rats with diabetes, a diet containing 20% finger millet led to lower fasting blood sugar levels and a drop in triglyceride and cholesterol levels.

May help lower cholesterol

Millet contains soluble fibre, which produces a viscous substance in your gut. In turn, this traps fats and helps reduce cholesterol levels. One study in 24 rats found that those fed foxtail and proso millet had significantly reduced triglyceride levels, compared with the control group. Additionally, millet protein may help lower cholesterol. A study in mice with type 2 diabetes fed them a high fat diet with millet protein concentrate. This led to a decrease in triglyceride levels and significant increase in adiponectin and HDL (good) cholesterol levels, compared with the control group. Adiponectin is a hormone with an anti-inflammatory effect that supports heart health and stimulates fatty acid oxidation. Its levels are usually lower in people with obesity and type 2 diabetes.

Fits a gluten-free diet

Millet is a gluten-free grain, making it a viable choice for people with celiac disease or those following a gluten-free diet. Gluten is a protein that occurs naturally in grains like wheat, barley, and rye. People with celiac disease or gluten intolerance must avoid it because it triggers harmful digestive symptoms, such as diarrhea and nutrient malabsorption. When shopping for millet, you should still look for a label that certifies it gluten-free to ensure it hasn't been contaminated with any gluten-containing ingredients.



Conclusion

Millet is a whole grain that's packed with protein, antioxidants, and nutrients. It may have numerous health benefits, such as helping lower your blood sugar and cholesterol levels. Plus, it's gluten-free, making it an excellent choice for people who have celiac disease or follow a gluten-free diet. Its nutty taste and versatility make it well worth trying.

References

<http://www.milletsodisha.com/millets-benefits-and-nutritional-information>

<https://www.healthline.com/nutrition/what-is-millet#bottom-line>

<https://en.wikipedia.org/wiki/Millet>

<http://exploreit.icrisat.org/profile/Small%20millets/187>

