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Nutritional Aspects & Health Benefits of Millets

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Introduction

Millets, also known as Nutri-cereals, are high-energy foods that have been domesticated and farmed since 10,000 years ago. The term "millet" comes from the French word "Mile," which means "thousand," implying that a handful of millet contains thousands of grains. Millets are C4 plants with extremely high photosynthetic efficiency, short duration, increased dry matter production capacity, and strong heat and drought resistance. The following seven millet varieties are widely grown worldwide, including pearl millet (Pennisetum glaucum L.), foxtail millet (Setariaitalica L. subsp. Italica), Finger millet (Eleusine coracana L.), barnyard millet (Echinochloa esculenta A. and Echinochloacolona L.), proso millet (Panicum miliaceum L.

The combination of people's sedentary lifestyle and overreliance on cereals following the green revolution has led to an increase in obesity, diabetes, coronary disease, gastrointestinal disorders, and colon, breast, and oesophageal cancer.Millets are a generally excellent source of fiber, minerals, and B-complex vitamins andare also abundant in phytochemicals such as polyphenols, lignans, phytosterols, phytoestrogens, and phytocyanins. They act as antioxidants, immunological modulators, and detoxifying agents and also protect against age-related degenerative diseases such as cardiovascular disease (CVD), diabetes, and cancer. Consumption of millet lowers the risk of heart disease, protects against diabetes, improves the digestive system, lowers the risk of cancer, detoxifies the body, boosts immunity in respiratory health, boosts energy levels, and protects against numerous degenerative diseases such as metabolic syndrome and Parkinson's disease.The only way to combat this is by incorporating millets into our daily diet.

Vernacular Names of Millets

English	Sorghum	Pearl Millet	Finger millet	Little millet	Kodo millet	Foxtail/ Italian millet	Barnyard millet	Proso millet

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Hindi	Jowar	Bajra	Mandua	Kutki	Kodon	KangniKakum	Sanwa Jhangon	Barre
Tamil	Cholam	Kamboo	Kelvaragu	Samai	Varagu	Tenai	Kuthiravaali	Panivaragu

Nutritional Aspects:

Millets are a good source of protein, minerals, and phytochemicals and are nutritionally comparable to other types of cereal. The edible part of the millet kernel contains phytochemicals such as dietary fibre and polyphenols (0.2-0.3%). Sorghum includes about 10% protein and 3.5% lipids, finger millet contains 12-16% protein and 2-5% lipids. Soaking, malting, decortication, and cooking all have an impact on the anti-oxidant concentration and activity.

Carbohydrates

The millet grain contains approximately 65% carbohydrate, a large portion of which is in the form of non-starchy polysaccharides and dietary fibre, which aid in the prevention of constipation, the reduction of blood cholesterol, and the slow release of glucose into the bloodstream during digestion. Regular millet consumers have a lower incidence of cardiovascular disease, duodenal ulcers, and hyperglycemia (diabetes).

Finger millet has the highest carbohydrate content of all millets, with 72.05 g/100g, followed by proso millet (70.4 g/100g), barnyard millet (68.8 g/100g), pearl millet (67.0 g/100g), kodo millet (66.6 g/100g), and small millet (65.55 g/100g). Foxtail millet has the lowest carbohydrate content.Most millets contain between 60% and 70% of carbohydrates, with the majority of these being non-starchy polysaccharides, which contributes to the many health benefits of millets. They are the best diets for diabetic patients due to their low carbohydrate content and non-glutinous nature. The Cooked millet flour contains moreSlowly Digestible Starchcontent (15-25%) than regular rice, wheat, or maize flour. These SDS's nutritional qualities are crucial for the prolongeddigestion and absorption of carbohydrates. Due to this unique property millets are beneficial for the dietary management of metabolic disorders such as diabetes and hyperlipidemia, as well as for healthy subjects. As a result, millets are receiving a lot of attention as a new functional food.

Protein

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Protein is an essential component of a healthy diet.Proteins contain chemical 'building blocks' known as amino acids.Amino acids are used by the body to build and repair muscles and bones, as well as to make hormones and enzymes. They can also be used as a source of energy. Proso millet has the highest protein content (12.5 g/100gm).Millets have a higher proportion of vital amino acids than most other cereals. These are the building blocks of protein. Furthermore, millets are a strong source of most essential amino acids such as methionine, cysteine, and lysine, providing significant dietary benefits to vegetarians who rely on plant foods to meet their nutritional needs. The essential amino acid profile of millet protein is superior to that of maize and other cereals. Millets contain cross-linked prolamins, which contributes to their high protein digestibility.

Lipids

The millets are also high in fats, and millet oil is a good source of oleic acid, linoleic acid, palmitic acid, and tocopherols, which are known to play an important role in the human immune system and defence mechanism. The fat content of millets ranges from 1% to 5%, with finger and kodo millet having the lowest (1%), and pearl, foxtail, and proso millets having the highest (5%). Millets have a low saturated fatty acid content of 17.9-21.6% and a high unsaturated fatty acid content of 78-82%. This is beneficial for health and cardiovascular diseases.

Dietary Fibre

Millets are high in nutrients and fibre. They are a good source of phytochemicals, micronutrients, and protein. Millets have 7-12% protein, 2-5% fat, 65-75% carbohydrates, and 15-20% fibre.The bran of millets is high in dietary fibre, also known as complex unavailable polysaccharides.The total dietary fibre in pearl millet (20.8%) and finger millet (18.6%) was higher than that in sorghum (14.2%), wheat (17.2%), and rice (8.3%). Dietary fibre plays a crucial part in lowering blood glucose levels and insulin response because of its higher viscosity, glycemic index, and water-holding capacity.

Vitamins & Minerals

Millets are a rich source of calcium (10–348 mg/100 g), iron (2.2–17.7 mg/100 g), zinc (32.7–60.6 mg/100 g), and phosphorus (200–339 mg/100 g), vitamins such as thiamine (0.15–0.60 mg/100 g), niacin (0.09–1.11 mg/100 g), and riboflavin (0.28–1.65 mg/100 g), that makes them a perfect energy food. Finger millet has 130 mg/100g of magnesium and the

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highest calcium content (344 mg/100g); it is also highly abundant in phytates (0.48g/100g), polyphenols (0.61%), and tannins (0.61%).

The barnyard millet and foxtail millet have the highest mineral nutrient concentration even among millets, while barnyard millet contains six times higher mineral content than rice.Kodo millet is rich in B vitamins especially niacin, pyridoxine, and folic acid as well as the minerals such as calcium, iron,potassium, magnesium, zinc. It is also rich in fiber and low in fat content. It contains a high amount of lecithin and is excellent for strengthening the nervous system.Sorghum is considered a good source of potassium andis practically devoid of sodium. Whole grains are good sources of magnesium, iron, zinc, and copper. Finger milletis a good source of dietary calcium.

Phytochemicals

Millets are high in phytochemicals and micronutrients. Millets contain phytochemicals such as phenolics, sterols, lignans, inulin, resistant starch, -glucan, phytates, tocopherol, dietary fibre, and carotenoids. Polyphenols are phenolic acids and tannins; flavonoids are present in small amounts and act as antioxidants and play a role in the body's immune system. Foxtail millet contains 47mg polyphenolics/100 g and 3.34 mg tocopherol/100 whereas proso millet contains 29 mg polyphenolics/100 g and 2.22 mg tocopherol/100 g. Millets are high in nutrients and provide numerous health benefits. Millets aid in the fight against obesity

Health benefits of millets

Cardiovascular diseases

Millet grains are the powerhouse of nutrition that helps in improving heart health and effectively trim down coronary blockage. They are enriched with magnesium, potassium, and plant lignins, which effectively reduce blood pressure by acting as a vasodilator and decreasing heart attacks and other cardiovascular risks. The high fiber content of millets lowers the cholesterol level thus eliminating LDL (Low-Density Lipoprotein) from the system and increasing the positive effects of HDL (High-Density Lipoprotein) in the body.Porso-millet protein concentrate can help lower high plasma lipid levels. Phytochemicals including phytic acid help the lowering of plasma triglycerides. According to research, eating whole millet grains on a regular basis lowers the risk of CVD.

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Finger millet is also a good source of essential amino acids such as arginine, lysine, methionine, and lecithin, and it performs a number of important health-promoting functions such as 1. Enhances immune function and reproduction. 2. Lowers the risk of cardiovascular disease and adipose tissue body fat 3. Improves insulin sensitivity and memory formation, among other things. 4. Lower your blood pressure.

Obesity

The biggest emerging problem in India is obesity, which is associated with many chronic conditions like diabetes and cardiovascular disease (CVD). High-fiber food consumption helps with bowel function and lowers the prevalence of obesity. Millets have a dietary fibre content of 22%, which is higher than the contents of other cereals like wheat (12.6%), rice (4.6%), and maize (13.4%). Millets' high fibre content helps to alleviate constipation, flatulence, bloating, and stomach cramping. Millets help in weight management and the reduction of obesity by satisfying hunger.

Detoxification

Millets have also been shown to have antioxidant activity, anti-diabetic, anti-tumorigenic, anti-atherosclerogenic, and antimicrobial properties.Millets, which contain phytates, polyphenols, and tannins, contribute to antioxidant activity and play an important role in aging and metabolic diseases.Numerous antioxidants in millet are effective at removing other toxins from the body, including those found in the kidney and liver, as well as neutralizing free radicals, which can cause cancer. Millets are high in curcumin, ellagic acid, quercetin, and other beneficial catechins that help the body eliminate toxins and xenobiotics by promoting proper excretion and neutralizing enzymatic activity. Therefore, millet grains can be used as functional food ingredients and as sources of natural antioxidants.

Cancer

The abundance of phenolic acids, tannins, phytates, and dietary fibre in millet grains exhibits antimutagenic and anti-carcinogenic properties. Regular consumption of millet lowers the risk of colon, breast, and esophageal cancer. Recent studies have shown that women who consume 30 g of dietary fibre daily can almost 50% lower their risk of developing breast cancer. Sorghum contains polyphenols and tannins that can inhibit the growth of cancerous and mutagenic cells in humans.

Diabetes

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Consuming millet thus helps control blood glucose levels and also aids in dermal wound healing through the use of antioxidants. Diabetes can be effectively managed by consuming pearl millet. It digests slowly and releases glucose into the blood at a slower rate than other foods because of its high fibre content. This effectively helps in maintaining the blood sugar level constant in diabetes patients for a long period of time. sorghum-based foods have a low GI and help to maintain blood glucose levels. Due to their high fibre content, finger millet diets had a low glycemic response. The fiber, magnesium, vitamin -E, phenolic compounds, and tannins present in foods reduce the risk of diabetes as they slower the sudden increase of blood glucose and insulin levels.

Gastrointestinal Disorders

The fiber content in millet helpin eliminating disorders like constipation, excess gas, bloating, and cramping. Celiac disease is usually triggered by the ingestion of gluten in susceptible individuals. A gluten-free diet primarily plays a major role in the management of the celiac disease. Millets have significant potential in foods and beverages because they are gluten-free. Millets are safe for individuals who have celiac disease or gluten sensitivity because they are non-glutinous, non-acidic, easily digestible, and non-allergenic.They can meet the growing demand for gluten-free foods and will be suitable for celiac disease patients. Replacing cereals like wheat, barley, and rye-based foods made from gluten-free grains, including rice, corn, sorghum, millet, amaranth, buckwheat, quinoa, and wild rice may help people adhere to the gluten-free diet.

Conclusion

Millets have more nutritional potential than popular cereals such as rice, wheat, and barley in terms of protein, carbohydrates, and energy values. Millets are a rich source of essential amino acids, fatty acids, and dietary fiber. The presence of phytochemicals such as polyphenols, tocopherols, phytosterols, and dietary fibre accounts for the majority of the health benefits.Millets reduce the risk of heart disease, millets help with diabetes, improve the digestive system, help in respiratory health, help in fighting cancer, help in several degenerative diseases like metabolic syndrome, improve the neurological and muscular systems, and improve respiratory health. Millets are the least allergic foods, are easily digestible, and are the best food for gluten-sensitive patients.