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Nutritional and Health Benefit of Millets Obtained in Vidarbha Region of Maharashtra, India

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ABSTRACT

Millets is an important ancient cereal which known for its nutritional value. They are a whole grains that are high in nutrients and have many health benefits .Millets is a good source of protein, fiber vitamins and minerals .The potential health benefit of millets include protecting cardiovascular health, preventing the onset of diabetes , helping people achieve and maintain a good health. They are nutria-cereals which are highly nutritious and are known to fibers, vitamins -B, minerals such as calcium, iron, zinc, potassium and magnesium. Technologist and Nutriologist are showing growing interest in millets due to its nutritional benefit and potential heath advantage.

Keywords: Millets, Health benefit, Nutrients

INTRODUCTION

A Farmer is a person who is engaged or work in agriculture, raising living organisms for food or raw material. The crops is favored due to its productivity and short growing season under dry, high -temperature condition the most widely grown millets is pearl millets, which is an important crop in India and parts of Africa finger millets, prose millets, and Foxtail millets are also important crop species. Millets foods are classified as potential prebiotics and increase the viablity or activity of probiotic with significant health benefit. Pearl millets can be recommended in the treatment of cervical disease, constipation and much non-infection disease. Millets is rich in phenolic compounds, especially folic acid and catechins.

Millets grains are rich in phytochemical, especially phenolic compounds. Millets contain soluble fiber, which produces a viscous substance in your guts. In turn, it traps fats and help lower cholesterol level .Millets are also good for the environment with low water and input requirement. With the aim to created awareness and increase production and consumption of millets, united Nation, at the behest of the Government of India, declared 2023 the International year millets. The farmers seldom, therefore, have an assured market in the events of surplus production. The cereal consideration in this publication includes sorghum, pearl millets, finger millets, foxtail millets, common millets, barnyard millets and kodo millets.

HISTORY AND ORIGIN

Sorghum-It is originated in north-eastern Africa, with domestication having taken place there around 5,000-8,000 year ago. The largest diversity of cultivated and wild sorghum is also found in this part of

Africa.

Pearl Millets-It was domesticated 4000 year ago and then spread to India 3000 year ago and to southern Africa 2000 year ago. India is considered as the secondary center of diversity. It is also traditional crop are mainly cultivated in India.

Kodo- kodo millets (*Paspalumscro biculatum)* originated in tropical Africa and was domesticated in india around 3,000 years ago. It is now cultivated in many countries, including India, the Philippines, Indonesia, Vietnam, Thailand, and West Africa.

Foxtail millets- Foxtail millets may have originated from china, where its cultivation dates back to 5000BC.It probably spread from the highlands of Central China towards India and Europe and now be found all over the world .

Proso millets- Proso millets (*Panicum miliaceum*) is believed to have been domesticated in china around 10,000year ago. The name"Proso"comes from the pansalvic name for millets, which is used in Russia and Poland. Proso millets may have originated from china.

NUTRITIONAL QUALITY OF MILLETS

The nutritional quality of food plays a critical role in maintaining overall human physical well-being, as it contributes to sustained health and development while maximizing human genetic potential. Whole-foods and plant-based diets have been shown to offer numerous health benefits and are associated with reduced risk of various diseases, including cancer, diabetes, obesity, and heart diseases. Millets are rich in physiologically active substances and offer numerous health benefits, including a high antioxidant content, significant fiber content, low glycemic index, and gluten-free protein.

TYPES OF MILLETS

Millets and categorized into two types: major millets and minor millets. The major millets include pearl millets, Proso or white millets, and Finger millets on the other hand, the minor millets comprise Barnyard millets, Little millets, Guinea miilets, Kodo millets and sorghum.

Millets	Scientific name	Common name	Color	Shape and size	Origin
Finger millets	*Eleusine coracana*	Ragi, Wimbi, Kapai,	Light brown to dark brown	Spherical size-1-2mm in dia	East central Africa
Pearl millets	*Pennisetum glaucum*	Bajra, Cattail millets Black millets, German millets	White, grey, pale yellow or brown	Ovoid size-3-4 mm	Tropical west Africa
Proso millets	*Panicum milianeum*	cheena, common millets, broom millets, vari	Colour-white cream, yellow, orange	size-3mm long & 2 mm in diameter shape-spherical	Central and eastern Asia
Foxtail millets	*Setaria italic*	India paspalumkangni, water couch, Italian millets, Rala	Colour-pale yellow to orange	Shape-ovoid Size-2mm length	China

Kodo millets	*Paspalum scrobiculatum*	Kodoara, Dicth millets, Creeeping Paspalum	Colour - blackish brown to dark brown	Size-1.2to 9.5long Shape-Elliptical to oval	India &west Africa
Barnyard millets	*Echinochlo acrusgalli*	Bhagar, sawan, jhingora,oodalu	Colour-white	Size-2-3mm long Shape-Tiny round	Japan & India

NUTRITIONAL IMPORTANCE AND HEALTH BENEFIT OF MILLETS

SORGHUM MILLETS

Sorghum (*Sorghum bicolor* (L) Moench) is a warm season crop, intolerant of low temperatures but fairly resistant to serious pests and diseases. It is known by a variety of names (such as great millet and guinea corn in West Africa, Asia and parts of Middle East). Most of the sorghum produced in North and Central America, South America and Oceania is used for animal feed . The grain consists of naked caryopsis, made up of a pericarp, endosperm and germ. Although there is a huge range of physical diversity, sorghum are classed into four groups: (1) grain sorghum, (2) forage sorghum glum; (3) grass sorghum; or (4) Sudan sorghums and broomcorn.

Nutritional Importance of Sorghum

Grain sorghum has certain properties which makes it suitable to be consumed by population suffering from chronic disorders. Protein content and composition of sorghum varies from cultivar to cultivar due to agronomic conditions (water availability, soil fertility, temperatures and environmental conditions during grain development) and genotype are chiefly located in the endosperm (80%), germ (16%) and pericarp (3%). The sorghum carbohydrate content is composed of starch, soluble sugar and fiber.

Carbohydrates in sorghum are classified into non-structural (sugars, starch and fructosans) and structural (cellulose, hemicelluloses and pectin substances). Sorghum contains slow digestible starch in good amounts, which has functional property, prolongs digestion and absorption of carbohydrates in intestine. This slow digestible starch is favorable for dietary management and also for metabolic disorders such as diabetes and hyperlipidemia.

Health Benefits of Sorghum

1. **Celiac disease-** This disease is caused by an adverse reaction of the immune system to gluten and it may lead to severe abdominal pains. Sorghum can be a healthy diet for those who are ailing from celiac disease as it is gluten free. Sorghum products could not modify the level of anti-transglutaminase antibodies after prolonged consumption.
2. **Obesity-** It aids to the hunger satisfaction, increases satiety and thereby reducing the risk of development of obesity. It disorder involving excessive body fat that increase the risk of health

problem. Obesity often results from taking in more calorie than are burned by exercise and daily activites.

3. **Diabetes-** The prevalence of diabetes type 2 is on the rise across the globe at an alarming rate, especially in India where the prevalence of diabetes has reached 14.3% People who eat three or more servings of whole grains in a day, especially from high-fiber cereals, are less likely to develop insulin resistance .
4. **Coronary Heart Disease-** A long term prospective study by Heidemannelal. (2008) showed that regular consumption of balanced diet which includes whole grains, vegetable, fruit, fish and poultry diet reduce the risk of CVD and total mortality.

Finger Millet

Finger millet (*Eleusine coracana* (L.) Gaertn) is a cereal grass grown mostly for its grain. Finger millet is a robust, tufted, tillering annual grass, up to 170 cm high.The inflorescence is a panicle with 4-19 finger-like spikes that resembles a fist when mature, hence the name finger millets.The seed pericarp is independent from the kernel and can be easily removed from the seed coat. It is also considered a helpful famine crop as it is easily stored for lean years . The grain is readily digestible, highly nutritious and versatile, and can be cooked like rice, ground to make porridge or flour or used to make cake.

Nutritional Importance- Finger millet is carbohydrate content of finger millet has been reported to be in the range of 72 to 79.5% .The carbohydrates include starch as the main constituent being 59.4 to 70.2% .Finger millet starch granules exhibit polygonal rhombic shape.About 80 to 85% of the finger millet starch is amylopectin and remaining 15 to 20% is amylose. The non-starch polysaccharide accounts for 20 to 30% of the total carbohydrates in finger millets. It contains around 1.5% reducing sugar and 0.03% non-reducing sugar. The white varieties have higher protein content than the brown varieties of the finger millet. Finger millet contains 44.7%essential amino acids of the total amino acids, which is higher than the 33.9 % essential amino acids.The total dietary fibre (TDF), insoluble dietary fibre (IDF), and soluble dietary fibre (SDF) con tent in finger millet was found to be 12, 11 and 2%, respectively. It was reported that 18.6% dietary fibre and 3.6% crude fibre in finger millet .

Health Benefits of Finger Millet

- Finger millet is reported to have anti-ulcerative properties and finger millet diets lowered blood glucose and cholesterol in diabetic rat models (36% reduction in blood glucose levels)
- Finger millet seed coat matter which is a rich source of dietary fibre and phenolic compounds were found to exhibitblood glucose and cholesterol lowering, nephron-protective and anti-cataractogenic properties in streptozotocin induced diabetic rat models
- Supplementing infants with the germinated finger millet-based food showed a general improvement on hemoglobin status

- Lower serum cholesterol and triacylglycerol levels (43% and 62%, respectively) compared to diabetic controls

Pearl Millet

Pearl millet (*Pennisetum glaucum* (L) R. Br.) originated in Central tropical Africa and is widely distributed in the drier tropics and India . Pearl millet has traditionally been an important grain, forage, and stover crop primarily in the arid and subtropical regions of many developing countries. As pearl millet cultivation expands into non-traditional areas in temperate and developed countries, production constraints from diseases are assuming greater importance. Pearl millet is well adapted to growing areas characterized by drought, low soil fertility, and high temperature. It performs well in soils with high salinity or low pH. Because of its tolerance to difficult growing conditions, it can be grown in areas where other cereal crops, such as maize or wheat, would not survive. It contain many essential mineral like magnesium, phosphorus, zinc, amino acids and vitamins.

Nutritional Importance- The proportion of sucrose in total sugar was lower in pearl millet than in sorghum.Pearl. It has been grown in Africa and the Indian subcontinent since prehistoric times. In different pearl millet genotypes the starch content of the grain varied about 62.8 to 70.5%, soluble sugar 1.2 to 2.6% and amylose 21.9 to 28.8% .Lower values for starch (56.3 to 63.7%) and amylose (18.3 to 24.6%) have been found in some high-yielding Indian pearl millet varieties . Jambunathan and Subramanian found that the predominant component of total soluble sugar (2.16 to 2.78%) was sucrose (66%), followed by raffinose (28%). Other sugars detected in measurable amounts were stachyose, glucose and millet, like sorghum, is generally 9 to 13% protein, but large variations in protein content, from 6 to 21%, have been observed A significant inverse correlation has been reported between the level of protein in the grain and the Lysine content of the protein. The essential amino acid profile shows more lysine, threonine, methionine and cystine in pearl millet protein than in proteins of sorghum and other millets. Its tryptophan content is also higher.

Nutritional and Health Benefits of Millets

- **Beneficial for Heart health:** The lignin and phytonutrients in millet act as strong antioxidants thus preventing heart related diseases. This is why, pearl millet is considered good for heart health.
- **Beneficial due to high amount of magnesium:** Pearl millet contains high concentration of magnesium which helps reduce severity of respiratory problems for asthma patients and is also effective in reducing migraine attacks
- **Helps in bone growth development and repair**: 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.

- **Helps in weight loss**: The biggest challenge faced by people trying to lose weight is controlling their food intake. Pearl millet can aid the process of weight loss as it is high in fibre content. Owing to its fibre content it takes longer for the grain to move from the stomach to the intestines.

Proso Millet

Proso millet (*Panicum miliaceum* (L.)) is an annual grass, growing from seed each year. It's origin goes back in history at least as far as 2000 B.C. when it is reported to have been grown in the Central regions of Europe. This plant is especially well suited to dry climates such as Central Russia, the Middle East, Northern India, Africa, Manchuria, and the Great Plains area of North America. Proso millet was first introduced to Canada in the 17th century, and was used in a limited way as a forage crop in the early 1900's. Proso millet is a relatively low demanding crop and diseases aren't known. That's why Proso millet is often used in organic farming systems in Europe. In the United States it is often used as an intercrop. Thereby, Proso millet can help to avoid a summer fallow, and continuous crop rotation can be achieved. Its superficial root system and its resistance to atrazine residue make Proso millet a good intercrop between two water and pesticide demanding crops. The stubbles of the last crop, by allowing more heat into the soil, result in a faster and earlier millet growth.

Kodo Millet

Kodo millet (*Paspalum scrobiculatum (*L.)) is widely distributed in damp habitats across the tropics and subtropics of the world. This cereal is also known as varagu, haraka and arakalu. It forms the main stay of the dietary nutritional requirements. It has high protein content (11%), low fat (4.2%) and very high fibre content (14.3%). Kodo millet is very easy to digest, it contains a high amount of lecithin and is excellent for strengthening the nervous system. Kodo millets are rich in B vitamins, especially niacin, B6 and folic acid, as well as the minerals such as calcium, iron, potassium, magnesium and zinc. Kodo millets contain no gluten and is good for people who are gluten intolerant. Regular consumption of kodo millet is very beneficial for postmenopausal women suffering from signs of cardiovascular disease, like high blood pressure and high cholesterol levels.

Foxtail Millet

Foxtail millet (*Setaria italica (L.) P. Beauvois)* is regarded as a native of China, it is one of the world's oldest cultivated crops. Foxtail millet ranks second in the total world production of millets and continues to have an important place in the world agriculture providing approximately six million tons of food to millions of people, mainly on poor or marginal soils in southern Europe and in temperate, subtropical and tropical Asia. It will grow in altitudes from sea level to 2000 m. It cannot tolerate water logging. Foxtail millet is fairly tolerant of drought; it can escape some drought because of early maturity.

MILLETS IN MODERN FOODS

Multi-grain millet flour, flakes of sorghum and pearl millet, finger millet malt, sorghum rawa and pasta, millets based breakfast cereals, millets based regional snacks and fast foods, etc. are the commercially available millets products in India both in retail and online. More extrusion based and bakery products are in the offing from different entrepreneurs. The 'organic' factor of millets is working in favour of uptake of these products in India, where gluten allergy issues are not so much present or ignored. However, they can be converted into liquid or semiliquid food products, such as porridge and other traditional household foods. Therefore, there is a need for innovative processing technologies to convert millet grains into liquid foods such as drinks of high nutritional quality and safety that can be consumed by large populations in rural and urban areas.

CONCLUSION

- Millets are high in energy, protein, calcium, iron, zinc, lipids and fibers.
- They also contain antioxidant, bioactive peptides and phenolic compounds properties
- Milltes can help to prevent and treat many health problem hard disease, diabetes, cancer, digestive health and blood pressure
- They are an excellent addition to healthy died and can be consumed in various form including whole grains, flour and processed product.

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