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Minor millets-their Potential Health Benefits and Medicinal Properties: A Review

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ABSTRACT

In the current century, climate change, water scarcity, food scarcity, increasing world population, rising in food prices and other socioeconomic impacts are expected to generate a great threat to agriculture, food and nutrition security worldwide, especially for the people who live in arid and sub arid regions. These impacts are present challenge to investigate the possibilities to overcome the hunger and poverty. Millet grains have potential health benefits as draught resistant crop yield productivity is good in the areas with water scarcity. Millet is an alkaline forming grain that is gluten-free. Millets are also rich sources of phytochemicals and micronutrients; they play many important roles in the body immune system. Millets have medicinal and nutraceutical properties in the form of antioxidants which prevent deterioration of human health such as lowering blood pressure, risk of heart disease, obesity, prevention of cancer and cardiovascular diseases, diabetes and decreasing tumor cases etc. Alkaline based diet is often recommended to achieve optimal health. In developing country, cereal-based foods have low bioavailability of minerals like iron and zinc that initiate critical problem for infants and young children. Food processing techniques are used to enhance nutritional quality, improve the digestibility and bioavailability of food nutrients with reducing anti-nutrients. This review mainly focuses on potential health benefits and nutritional properties of millet grains and to know the nutrient content of different millets.

Key words: *Food and nutrition security, Health benefits, Millets, Medicinal and Nutritional quality.*

INTRODUCTION

Millet is a generic term used for small sized grains that form heterogeneous group and referred along with maize and sorghum as 'coarse cereals'. Millets are of minor importance in the west but a staple food in the diets of African and Asiatic people. Their agricultural importance arises from their hardiness, tolerance to extreme weather and could be grown with low inputs in low rainfall areas.

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Bajra or pearl millet (*Pennisetum americanum*), *ragi* or finger millet (*Eleusine coracana*), *navane* or foxtail millet (*Setaria italica*), *samai* or little millet (*Panicum miliare*), *haraka* or kodo millet (*Paspalum scrobiculatum*), *baragu* or proso millet (*Panicum miliaceum*), oodalu or barnyard millet (*Echinochloa frumentacea*) are the important millets cultivated largely in the Asian and African countries. Most of the millets are grown in different regions of the world from east to west. The world total production of millet grain was 7,62,712 metric tons and India top ranking with a production of 3,34,500 tons in 2010.

Millets are considered as crop of food security because of their sustainability in adverse agro-climatic conditions[24]. These crops have substantive potential in broadening the genetic diversity in the food basket and ensuring improved food and nutrition security[10]. Along with nutrition millets offer health benefits in daily diet and help in the management of disorders like diabetes mellitus, obesity, hyperlipidemia, cancer etc.[27]. Millets are having unique advantage for health, being rich in micronutrients, particularly minerals and B vitamins as well as nutraceuticals. Though millets are not the important part of daily diet of American and European people, now these countries have recognized the importance of millets as ingredient in multigrain and gluten-free cereal products. However, in many Asian and African countries millet is the staple food of the people in millet producing areas and used to prepare various traditional foods and beverages like *idli*, *dosa*, *papad*, *chakli*, *porridges*, breads, infant and snack foods[4]. Whilst a number of traditional foods are made in the domestic household, the lack of large-scale industrial utilization discourages the farmers raising millet crops[22]. Therefore, many countries Including India, China, USA etc. have now started research projects to study and develop process technology for nutritional improvement, health benefits and to promote their utilization as food on large scale.

Nutrient composition and medicinal importance of Millets

Most of us find health at risk due to malnutrition of vital nutrients. Therefore, everyone is conscious of their daily diet, so that nutrition is at the core of the diet of people. Millet grains are nutritionally comparable and even superior to major cereals with respect to protein, energy, vitamins, and minerals as well as dietary fiber[18].

Millets are the rich source of minerals, nutraceuticals and higher dietary fibers than rice or wheat and which contains 9-14% protein, 70-80% carbohydrates. These are rich sources of phytochemicals and micronutrients[19]. The quality of protein is mainly a function of its essential amino acids. Finger millet contains 44.7% essential amino acids[13]. The characterization of the proteins of millet grains shows that prolamin fraction constitutes the major storage protein of the grain and lysine is the most limiting amino acid followed by cystine but millets are relatively high in methionine. So the nutritional status of a community has therefore been recognized as an important indicator of national development[19]. In the face of increasing population and stagnant wheat and rice productions, millets can be a promising alternative in solving the problem of food insecurity and malnutrition.

Finger millet seed coat is an edible material and contains good proportion of dietary fibre, minerals and phytochemicals. The seed coat matter (SCM) forms a by-product of millet milling, malting and decortication that can be utilized as composite flour in biscuit preparation[8]. Finger millet (*ragi*) is an extraordinary source of calcium. Kodo millet and little millet are also reported to have 37% to 38% of dietary fiber, which is the highest among the cereals and though low in fat content, it is high in PUFA (polyunsaturated fatty acids)[11]. It is also rich in essential amino acids, like lysine, threonine, valine, sulphur containing amino acids and the ratio of leucine to isoleucine is about 2:1[16].

Kodo millet has the highest free radical (DPPH) quenching activity followed by great

millet (sorghum) and finger millet[7]. Sorghum is exceptionally high in antioxidant activities followed by millets. Millets are valued for their high content of vitamin B, folic acid, phosphorus, iron and potassium. Finger millet contains 16 times more calcium than maize. The niacin content in pearl millet is higher than all other cereals. In addition, millets are gluten-free, easy to digest and are a great source of antioxidants and might have anti-carcinogenic properties[6].

Finally the most important thing is to prevent the micronutrient deficiencies one has to consume all the minor millets because they have got good nutritional and medicinal properties as discussed in the medicinal importance about the minor millets by various researches.

Table 1: Medicinal importance of minor millets

Sl.No.	Name of the Minor Millet	Biological Activity	Reference
1.	Foxtail millet (*Setaria italica*)	Type-2 diabetes	Anju Thathola *et al.,* 2010
2.	Finger millet (*Eleusine coracanda*)	Diabetes	Ryan *et al.,* 2011
3.	Finger millet (*Eleusine coracanda*)	Cardiovascular disease, Colon cancer, constipation, Diverticulosis, wound healing.	Mathanghi *et al.,* 2012.
4.	Finger millet (*Eleusine coracanda*)	Maintain body temperature during rainy season.	Pragya Singh and Rita Singh., 2011.
5.	Kodo millet (*Paspalum scrobiculatum*)	Severity of asthuma, migraine attacks, reduce high blood pressure, diabetic, Heart disease, atherosclerosis and heart attack.	Veenu Verma and Patel., 2012.
6.	Little millet (*Wheat semoline*)	Diabetes	Sunanda Itagi *et al.,* 2013
7.	Barnyard millet (*Echinochola frumentacea*)	Diabetes mellitus, obesity, hyperlipidemia.	Surekha *et al.,* 2013
8.	Finger millet (*Eleusine coracanda*)	Ascaris, folk remedy for leprosy, and liver disease.	Khouloud *et al.,* 2013.
9.	Pearl millet (*Pennisetum glaucum*)	Cancer, cardio vascular disease,reducing tumor incidence, lowering blood pressure.	Azhari *et al.,* 2014.
10.	Kodo millet (*Paspalum scrobiculatum*)	Diabetes	Manju and Paul Khurana, 2014
11.	Kodo millet (*Paspalum scrobiculatum*)	Coronary heart disease, Diabetes.	Vandana Mishra *et al.,* 2014
12.	Finger millet (*Eleusine cora canda*)	Diabetes mellitus, gastrointestinal tract disorder.	Gull *et al .,* 2014
13.	Pearl millet (*Pennisetum glaucum*)	Gastrointestinal disease, and Ulser	Hellen Mueni Ndiku and Mutuku Chrispus Ngule., (2015).
14.	Finger millet (*Eleusine cora canda)*	Cancer	Travis and Manish, 2015.
	Japanese Banyard millet (*Echinochola escuenta*)	Tumor necrosis	
	Proso millet(*Panicum miliare*)	Liver disease	
	Kodo millet (*Paspalum scrobiculatum*)	Diabetes	

CONCLUSION

Though minor millets have high fiber, nutritional and medicinal properties it has less attention among the farmer and public. In recent years, farmers are focusing only the major crops not the minor. But micronutrients are important for the balanced diet, Micronutrients deficiency leads to number of health related disorders. Minor millets are the best source for nutrients and medicinal properties, but minor millets are considered as poor millets and it has less attention. We discussed the medicinal importance about the minor millets of various researches. Hence we suggested through this review that there is an urgent need to have more attention and consideration on minor millets to avoid various health problems for developing healthy society.

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