

Role of Millets in Ensuring Nutritional Security

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Introduction

The United Nations General Assembly at its 75th session in March 2021 embarked 2023 as the International Year of Millets. Nutritional insecurity is a major threat to the world's population that is highly dependent on cereals-based diet which is deficient in micronutrients. Next to cereals, millets are the primary sources of energy in the semi-arid tropics and drought-prone regions. Millets hold great promise for food security and nutrition amid ever increasing agricultural costs, climate change and a burgeoning population to feed worldwide. The dietary shift from traditional to 'modern' foods is considered to be one of the main reasons for diet-related non-communicable illnesses as well as malnutrition in India. Millets are nutritionally superior as their grains contain high amount of proteins, essential amino acids, minerals, fibres and vitamins. Millets are smart food, good for human health, good for the farmer as resilient and climate-smart and good for the environment requiring less water and ensuring a low-carbon footprint. Millets facilitates future food security in a warming world.. In addition, they can be mix-cultivated along with pulses and vegetables.

Millets as Treasure of Trove Nutrients

- Millets are laden with nutrients like calcium, carbohydrates, protein, iron, magnesium, potassium and phosphorus; vitamins like folic acid, vitamin B6, β - Carotene, and niacin making them a preferable choice over the cereal grains.
- It also contains several bioactive photochemical including feraxans, lignans, β -glucan, inulin, resistant starch, sterols and phenolic compounds (e.g. ferulic acid, caffeic acid and quercetin). Studies have supported the role of polyphenols in antioxidant, anti-carcinogenic, anti-inflammatory, antiviral and neuroprotective activities which in all has shown to be beneficial against diseases like cancer and cardiovascular disease, diabetes, high blood pressure, high cholesterol, inflammatory diseases, metabolic syndrome and Parkinson's disease.

- Malnutrition, under-nutrition (deficiencies of vitamins, mineral and proteins) and over-nutrition (obesity, metabolic syndrome and lifestyle diseases) in India induce a shift to healthier, accessible and affordable millets which are nutri-dense, a rich source of protein, essential fatty acids, dietary fiber, vitamin B and gluten-free.
- Nutri-dense food grains like millets can prevent lifestyle diseases like diabetes, hypertension, and cardiovascular diseases, hence are viable solutions to rising malnutrition and food and nutrition security of India.
- A very high proportion of the millet grain comprises dietary fibre and non-starch polysaccharides which help in weight regulation. Due to high fiber content and the slow release of glucose, millets are an excellent choice of food for diabetics.
- This powerhouse scores way higher than rice and wheat on nutrients, fiber content and low glycemic index and morphed from the “Food of the Poor” to “Food to Boost Immunity”.

Pearl Millet



Pearl millet is known as *bajra* in Hindi, and *kambu* in Tamil. Pearl millet is used in various industrial products. 100 gm edible portion of pearl millet consists of 11.6gm protein, 67.5gm carbohydrate, 8mg iron and 132 microgram of carotene which is highly essential to safeguard our eyes. Pearl millet is used as an important source of food, feed and fodder wherever it is cultivated in our country. Pearl millet has high levels of vitamins B, and dietary minerals potassium, phosphorus, magnesium, iron, zinc copper and manganese. It is gluten free and is ideal for those with wheat allergies. Pearl millet has been found to be nutritionally superior to rice and wheat.

Finger Millet

Finger millet (*Eleusinecoracana* L.) ragi or mandua is one of the important millet grown extensively in various regions of India and Africa. With regard to protein (6-8%) and fat (1-2%) it is comparable to rice and with respect to mineral and micronutrient contents it is superior to rice and wheat. Nutritionally, it has high content of calcium (344 mg/100g), dietary fiber (15-20%) and phenolic compounds (0.3–3%). This minor millet contains important amino acids viz., isoleucine, leucine, methionine and phenyl alanine



which are deficient in other starchy meals. It is also known for several health benefits such as anti-diabetic, anti-tumorigenic, atherosclerogenic effects, antioxidant, which are mainly attributed due to its polyphenol and dietary fiber contents.

Foxtail Millets



Foxtail millet contains 75.2g/100g of carbohydrates, 10-12% proteins and 2.38-5 % fat. It produces 351 kcal of energy (Amadou *et al.*, 2013). However, a low carbohydrate content of (60.9 g/100g) has been also reported by Ballolli *et al.*, (2014). It is also a rich source of fibre and minerals. The fibre content is 8g/100g and 3.3g/100g of minerals. It is an excellent source of zinc (40.4 ppm) and iron (27.19 ppm) among millets (Chandelet *et al.*, 2014).

Proso Millet

Proso millet (*Panicummiliaceum* L.) contains the highest protein content (12.5%) among the small millets and also acquire 2nd position in fat content among millets i.e., 4.0g/100g. The protein of proso millet is gluten free and can be used for foods for people with gluten intolerance or celiac disease. Proso millet is also a good source of dietary fibre and has a lower glycaemic index (Park *et al.*, 2008). It reduces cholesterol levels and reduce the risk of heart diseases (Gomashe *et al.*, 2015, 2017). Results suggest that it may also improve glycemic responses and plasma levels (Park *et al.*, 2008). In addition, proso millet protein could be of use for potential therapeutic intervention in type 2 diabetes (Devi, *et al.*, 2011).



Little Millet



Little millet (*Panicummiliare* L.) is smaller than other millets. It is high in iron content and has high antioxidant activities. Little millet is a marvellous source of protein (10.13%), carbohydrates (65.55%), fat (3.89%), fiber (7.72%), iron (1.26 mg/100g), phosphorous (130 mg/100g), zinc (1.82 mg/100g), magnesium (91.41 mg/100g), niacin (1.29 mg/100g) and polyphenols making it a vital option for nutritional security. Magnesium helps to improve heart health, niacin to lower cholesterol, phosphorus in fat metabolism, body tissue repair and energy production. Little millet contains amino acids in balanced proportions and is rich in methionine, cysteine and lysine. It is specifically beneficial to



vegans dependent on plant foods for protein. These are recommended for people with lifestyle diseases like obesity, diabetes and cardiovascular conditions. Finger millet (*Eleusinecoracana* L.) ragi or mandua is one of the important millet grown extensively in various regions of India and Africa. With regard to protein (6-8%) and fat (1-2%) it is comparable to rice and with respect to mineral and micronutrient contents it is superior to rice and wheat. Nutritionally; it has high content of calcium (344 mg/100g), dietary fiber (15-20%) and phenolic compounds (0.3–3%). This minor millet contains important amino acids viz isoleucine, leucine, methionine and phenyl alanine which are deficient in other starchy meals. It is also known for several health benefits such as anti-diabetic, anti-tumerogenic, atherosclerogenic effects, antioxidant, which are mainly attributed due to its polyphenol and dietary fiber contents

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Kodo Millet



Kodo millet (*Paspalumscrobiculatum* L.) has high protein content (11%), low fat (4.2%) and very high fibre content (14.3%). It is rich in B vitamins especially niacin, pyridoxin and folic acid as well as minerals such as calcium, iron, potassium, magnesium and zinc. It contains a high amount of lecithin and might be beneficial for strengthening the nervous system (Padulosi *et al.*, 2009). An adequate fibre source helps combat the feeling of hunger. Kodo millet contains 66.6 g of carbohydrates and 353 kcal per 100 g of grain, comparable to other millets. It also contains 3.6 g of fat per 100 g. It provides minimal amounts of iron, at 0.5/100 mg, and minimal amounts of calcium, and 27/100 mg. Kodo millets also contain high amounts of polyphenols, an antioxidant compound (Hedge *et al.*, 2005).

Barnyard Millet



In terms of nutritive value, barnyard millet is superior to major and minor millets. Barnyard millet grains are a rich source of dietary fiber, iron, zinc, calcium, protein, magnesium, fat, vitamins, and some essential amino acids (Singh *et al.*, 2010; Salehet *al.*, 2013; Chandelet *al.*, 2014). Ugareet *al.*, (2014) reported that the crude fiber of barnyard millet is higher than any other cereal, ranging between 8.1 and 16.3%. The high ratio of carbohydrate to crude fiber ensures the slower release of sugars in the blood, and so thus aids in maintaining blood sugar level. The resistant starch in barnyard millet has shown to lower

blood glucose, serum cholesterol, and triglycerides in rats (Kumari and Thayumanavan, 1998).

Conclusion

Millets can grow on arid lands with minimal inputs, are resilient to changes in climate and recognized to have the potential to solve global nutritional security challenges, and as a sustainable alternative to major cereals. They are therefore an ideal solution for countries to increase self sufficiency and reduce reliance on imported cereal grains. Millets have a potential to assume significance not only for food security but also for nutritional security in India, because of their hard nature and ability to grow in rain-fed lands with very little agricultural inputs and richness of many nutrients as compared to most of the cereals

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