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163
166

Millet Consumption in Times of Pandemics

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Abstract

In emerging tropical regions, cultivable plant-based food supplies are incapable of meeting proteins for both animals and humans. In underdeveloped countries, cereal-based meals have low bioavailability of minerals such as iron and zinc, posing a serious challenge for newborn and young children. One unconventional method to addressing malnutrition and ensuring readiness for natural crises is to popularise the agricultural productivity of crops that are minimally grown in resource-constrained places. These crops, also known as underused crops, are cultivated in dry and semi-arid environments with low soil fertility, little rainfall, and minimal insect pest assault. Furthermore, these crops are nutritionally rich and have the ability to modify diets and combat food and nutritional deficits for marginal people. This paper aims to be concerned with and build a special agenda for these crops, which must be acknowledged as an essential food, and to promote millets as a nutritious diet, therefore meeting the nutritional needs of the world population and combating malnutrition especially in times of pandemic.

Introduction

Food security remains a concern, and the primary foods supplied do not give enough nutrition to combat problems such as COVID-19. Despite the focus on developing vaccines, therapeutic molecules, and preventive measures for the fight against COVID-19, hunger and malnutrition are still invisible threats to marginalized populations. Assuming a pandemic occurs in the near future, it will further exacerbate the crisis by impairing the ability of the marginal population to access food. This will have an enduring effect on humans, especially for children in India, Ethiopia, Somalia, Bhutan, and Sri Lanka, where poverty is prevalent. Food grain supply is an initial step to assist the impacted population, but long-term planning to mitigate such challenges are necessary. Having said that, the probability of a next COVID-19 wave in the near future should not be overlooked. In such a scenario, the UN World Food Programme anticipates that fatalities from a shortage of food will exceed mortality than that of the disease spread. A unique method to resolve food shortages and assuring resilience for natural crises is to popularise the production of crops that are minimally cultivated in resource-constrained places. These crops are also known as neglected crops and are cultivated in dry and semi-arid environments with low soil fertility, little rainfall, and minimal insect pest infestation, and they are called as 'the Millets.'

Small Millets

Millets are a general term that refers to coarse grains. It includes finger millet (*Eleusine coracana*), foxtail millet (*Setaria italica*), proso millet (*Panicum miliaceum*), barnyard millet (*Echinochloa crus-galli*), kodo

millet (*Paspalum scrobiculatum*) and little millet (*Panicum sumatrense*) (Figure 1). The pertinent role of small millets is not limited to addressing food and nutritional well-being, and it potentially extends to boosting immunity, providing fodder for cattle, improving biodiversity, and protecting the livelihood of farmers. Although there is no direct evidence that millets boost immunity, researchers suggest that the presence of minerals, vitamins, and antioxidants in the right composition in the grains would optimize the functioning of the immune system.

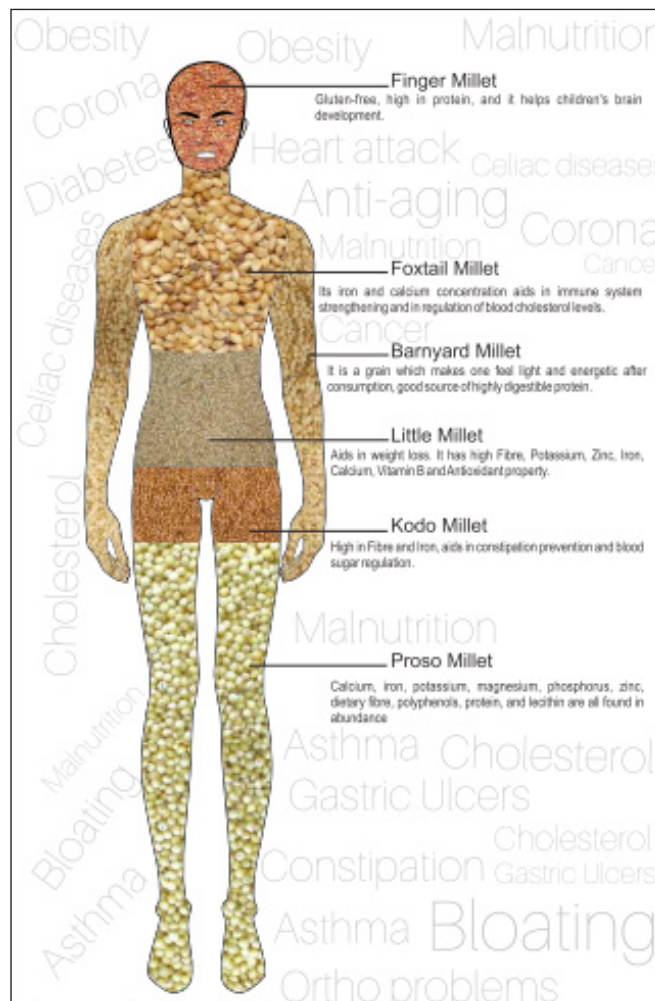


Figure 1: Small millets shown along with their key traits for fighting the major human diseases (Source: Muthamilarasan and Prasad, 2021)

Traditional Values of Millets

Millet grains are a significant source of nourishment for poor families as well as a primary source of income. In traditional systems, indigenous knowledge plays a central role in disease diagnosis and health care practices. Celiac disease is an immune mediated enteropathy that is induced by gluten consumption. Millets

are gluten free and can be used as a replacement for celiac disease and gluten sensitive people. Millet polyphenols have inhibitory effect against malt amylase, aldose reductase of cataract eye lenses. The phenolics in finger millet seed coat have been shown to reduce hyperglycemia by inhibiting the activities of the enzymes α -amylase and α -glucosidase. Finger millet seed coat phenolics have also been demonstrated to decrease cataractogenesis in human eye lenses. Food processing methods such as soaking, sprouting, fermenting, and puffing of millets increase nutritional quality, digestibility, and reduce antinutrient content in their cereals. It has been found that the presence of antinutrients in finger millet reduces glycemic impact, starch digestibility, and absorption. Pearl millets were primarily used to treat celiac disease, constipation, and a variety of non-communicable disorders. Foxtail millet is widely valued in China for its high nutritional content, easy digestion, and nonallergic qualities, and it also plays an important role in human health. Millets fermented products are used as probiotics and are indicated for the treatment of diarrhoea in infants.

Health Benefits of Millets

Millets are high in vitamins and minerals and include 60-70% carbs, 7-11% proteins, 1.5-5% fat, and 2-7% crude fibre. They are high in vitamin B, magnesium, and antioxidants. Other dietary minerals found in millet include manganese, phosphorus, and iron. Except for lysine and threonine, millet proteins are a decent supply of essential amino acids; however, they are particularly high in the sulphur-containing amino acids methionine and cysteine. Besides, millets include important fatty acids such as linoleic, oleic, and palmitic acids in free form. Other fatty acids present in trace levels include arachidic acid, behenic acid, and erucic acid. Millets are a key dietary component among the less wealthy groups. Millets are used to make roti, breads, porridge, snack and fast meals, infant foods, millet wine, millet health powder, and other traditional dishes and drinks. To list a few attractive and yet important features of millets related to the major diseases in the current scenario.

Diabetes

Diabetes risks have indeed been observed to be lower among millet-consuming communities. Millet phenolics, like alpha-glucosidase and pancreatic amylase, prevent postprandial hyperglycemia by partially blocking the enzymatic degradation of complex carbohydrates. Inhibitors such as aldose reductase limit sorbitol build-up and lower the incidence of diabetes-related cataract disease. Finger millet intake regulates blood glucose levels and boosts antioxidant status. A poor diet is a key factor to the increased prevalence of illnesses such as cardiovascular disease and diabetes. A recent study found that eating millets reduced the risk of developing type 2 diabetes and helped manage

type 2 diabetes, incorporating millets back to Indian diets will ensure a good health condition of people above 60 years who are highly prone to diabetes.

Obesity

Despite the consumption of calorie-dense meals in developed countries, micronutrient deficit exists. Micronutrients in foods are being depleted by modern food processing procedures. Obese people are malnourished as a result of low-cost, low-nutrient diets rich in calories. Millets have a low glycemic index (55.9), making them a diabetic-friendly meal. They minimize the severity of a rapid increase in blood sugar levels. Consuming millets promotes gradual, consistent blood sugar levels. Eating meals with a low glycemic index (GI) helps to control the body’s fat proportion. This aids weight reduction by reducing adipose tissue in the body. Research comparing the effect of a millet diet vs. a non-millet diet on diabetics found that a millet diet better manages blood glucose levels than a non-millet diet.

Cancer

Millets are high in phenolic acids, tannins, and phytate, which function as antinutrients. However, in animals, these antinutrients diminish the incidence of colon and breast cancer. Millet phenolics have been shown in vitro to be useful in the prevention of cancer development and progression.

Cardiovascular Disease

Millets are high in magnesium, which has been shown to reduce the symptoms of migraines and cardiac arrest. Millets are high in compounds such as phytic acid, which is believed to reduce cholesterol.

Aging

Non-enzymatic glycosylation is a biochemical process that occurs between the amino group of proteins and the aldehyde group of reducing sugars. It is a primary cause of ageing. Millets are high in antioxidants and phenolics, such as phytates, phenols, and tannins, which can help with antioxidant activity in health, ageing, and metabolic syndrome.

As discussed, Millets have an excellent nutritional quality and are comparable to some commonly consumed cereals like wheat and rice. By any nutritional parameter, millets are miles ahead of rice and wheat. In terms of their mineral content, they are in lead compared to rice and wheat. Millets also offer several health benefits to consumers. Each one of the millets has more fibre than rice and wheat, as much as fifty times that of rice. Finger millet has thirty times more calcium than rice (Table 1). In their Iron content, Barnyard and finger millet are so rich that rice is nowhere in the race. These crops lack gluten and hence can be consumed by people suffering from celiac disease. Millet consumption can also lower glycemic response, which can be helpful for the treatment of type II diabetes. Inclusion of millet in the human diet can also lower the risk of duodenal ulcers, anemia. For patients suffering from allergic diseases such as atopic dermatitis, Barnyard millet grains have been recommended to replace rice and wheat grains. Dietary fibre content in Pearl and Finger millet was found to be higher than that in sorghum, wheat and rice. Millets are also rich in phenolic acid and has high anti-oxidant activity. They are valuable sources of some essential minerals such as potassium, magnesium, calcium, iron and zinc. While most of us seek a micronutrient such as Beta Carotene in pharmaceutical pills and capsules, millets offer it in abundant quantities.

Table 1: Nutritional composition of various millets and cereals per 100 g

Millets/ Cereals	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Minerals (g)	Iron (mg)	Phosphorus (mg)	Calcium (mg)
Barnyard millet	6.2	2.2	65.5	9.8	4.4	5.0	280	20
Finger millet	7.2	1.92	66.8	3.6	2.7	4.6	210	364
Foxtail millet	12.3	4.3	60.1	6.7	3.3	2.8	188	31
Kodo millet	8.9	2.55	66.2	9.0	2.6	2.3	101	15.3
Little millet	10.1	3.89	65.5	7.6	4.5	1.2	130	16.1
Pearl millet	10.9	5.43	61.8	2.6-4.0	1.6-2.4	6.4	289	27.4
Proso millet	12.5	1.10	70.4	7.2	1.9	0.8	206	14
Sorghum	9.9	1.73	67.7	2.0	1.6	3.9	274	27.6
Corn	9.2	4.6	73.0	2.8	1.2	2.7	92-178	70-75
Rice	7.9	0.52	78.2	0.2	0.5	0.7	96	0.75
Wheat	10.6	1.47	64.7	1.2	1.5	3.9	315	39.4

Conclusion

The much-privileged rice, ironically, has zero quantity of this precious micronutrient. In this fashion, nutrient to nutrient, every single millet is extraordinarily superior to rice and wheat and therefore is the solution for the malnutrition that affects a vast majority of the Indian population. Despite their beneficial nutritional properties and tolerance for adverse growing conditions, millet consumption has been less compared to major cereals such as rice, wheat and corn. There is a need to increase awareness about the superior nutritional quality of millets and make them one of the important commodities in our food basket. The key to long-term weight loss is lifestyle change. One of the lifestyle changes for weight loss is healthy eating. Grains are the staple meals and the major source of carbs on every person's meal plate. When staples are supplied from wholegrains, the majority of the meal plate is balanced, and there is a strong probability of consuming an adequate quantity of micronutrients. This paper emphasized on nutraceutical properties of millets and

the application of millets as alternative cereals potentially healthy to elaborate therapeutic food products like protein and energy rich diet, diet for diabetes. This study showed that millets can be used as "food medicine".

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