Millets back to the Stage: ENSURING NUTRITION AND SUSTAINABILITY

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INTRODUCTION:

Millets are the major staple cereal crop for millions of small-scale dryland farmers in Asia and Sub-Saharan Africa. These are small-seeded crops such as pearl millet (*Pennisetum glaucum*), finger millet (*Eleusine coracana*), kodo millet (*Paspalum setaceum*), proso millet (*Panicum miliaceum*), foxtail millet (*Setaria italic*), little millet (*Panicum sumatrense*), and barnyard millet (*Echinochloa utilis*). These are one of the oldest foods known to humans and likely the first grain used for domestic purposes, are often described as super-grain, super-food, and wonder-grain. These are also known as Smart Food, and they are beneficial to consumers, the environment, and farmers. For instance, finger millet has three times the amount of calcium as compared to milk, and most millets have very high levels of iron and zinc, low glycaemic index, good levels of protein and fibre, and are gluten-free. Millets can also help to solve several of the world's most pressing challenges at the same time: poor diet (from malnutrition to obesity); environmental issues (climate change, water scarcity, and environmental degradation); and rural poverty. They have a low carbon footprint and can survive and thrive in hot climates with minimal water. They are climate-smart, making them a better risk management plan for farmers than rice and wheat, which are more resource-intensive. As a result, millet grains are currently gaining special attention from these poor countries in terms of food use, as well as from some developed countries in terms of its high potential for bioethanol and biofilm production.

NUTRITION

Food nutritional quality is an important aspect in supporting human total physical well-being because nutritional well-being is a long-term force for health and development, as well as the optimization of human genetic potential. As a result, dietary quality should be considered while tackling the problem of widespread food insecurity and malnutrition. In addition to their cultivating advantages, millets have been found to have high nutritive value and comparable to that of major cereals such as wheat and rice. It has also been reported that millet proteins are good sources of essential amino acids except lysine and threonine but are relatively high in methionine. They also contain significant amounts of essential amino acids particularly the sulphur containing amino acids (methionine and cysteine); they are also higher in fat content than maize, rice, and sorghum.

Amino acid profiles of different millets

Amino acids(g/100g)	Foxtail millet	Proso millet	Pearl millet	Finger millet
Essential Amino Acid				
Isoleucine	4.59	4.1	5.1	4.3
Leucine	13.60	12.2	14.1	10.8
Lysine	1.59	1.5	0.5	2.2
Methionine	3.06	2.2	1.0	2.9
Phenylalanine	6.27	5.5	7.6	6.0
Threonine	3.68	3.0	3.3	4.3
Valine	5.81	5.4	4.2	6.3
Histidine	2.11	2.1	1.7	2.3
Tryptophan	NA	0.8	1.2	NA
Non-Essential Amino Acid				
Alanine	9.30	10.9	8.1	6.1
Arginine	3.00	3.2	0.9	3.4
Aspartic Acid	7.71	6.2	6.2	5.7
Cystine	0.45	NA	0.8	NA
Glutamic Acid	22.00	21.3	22.8	23.2
Glycine	2.91	2.1	0.7	3.3
Serine	4.56	6.3	5.4	5.3
Tyrosine	2.44	4.0	2.7	3.6
Proline	5.54	7.3	8.2	9.9

MILLETS FOR DIABETES:

Consumption of whole grain meals is thought to be advantageous in the prevention and management of diabetes mellitus, and millet-consuming populations have been found to have a reduced diabetes incidence. Diabetics who switched their typical wheat chapati with multigrain chapati (millet and wheat in a 30:70 ratio) had significantly lower blood glucose levels, according to studies conducted on human diabetics in various rural and urban locales across India. It has also been observed that protein concentrates of Korean foxtail millet and proso millet dramatically increased plasma adiponectin and HDL cholesterol levels and caused significant decreases in insulin levels in type 2 diabetic mice when compared to a casein diet. Furthermore, proso millet also improved glycemic responses and plasma levels. Therefore, millets lower the blood glucose and insulin levels as they have a lower glycemic index which means the grains are digested and absorbed by the body slowly.

MILLETS FOR CARDIOVASCULAR DISEASES:

Obesity, smoking, a poor diet, and physical inactivity are all contributing to rising incidence of cardiovascular disease in most countries. According to studies, rats fed a diet of native and processed starch from barnyard millet had the lowest blood glucose, serum cholesterol, and triglycerides when compared to rice and other minor millets. In hyperlipidemic rats, finger millet and proso millet reduced plasma triglycerides, which may help to avoid cardiovascular disease.
Millets have been proven in studies to cut total cholesterol by 8% and blood cholesterol from high to normal levels. They also decrease the low and very low-density lipoprotein cholesterol (commonly viewed as 'bad cholesterol') and triacylglycerol levels in blood. Through these reductions, the levels go from above normal to normal range. Furthermore, consuming millets lowers blood pressure by 5% via lowering diastolic blood pressure. In addition, consuming millets reduces BMI by 7% in persons who are overweight or obese.

MILLETS AGAINST CANCER AND CELIAC DISEASE:

Millet grains are high in phenolic acids, tannins, and phytate, all of which serve as "antinutrients" in animals, lowering the incidence of colon and breast cancer. It has also been observed that people who consume sorghum and millet had lower rates of esophageal cancer than people who eat wheat or maize. In addition, millet phenolics may be useful in preventing cancer development and its progression.
People with celiac disease and other wheat, barley, or rye intolerances are increasing their demand for gluten-free foods and beverages in industrialized countries. Celiac disease is an immune-mediated enteropathy that occurs when gluten is consumed by genetically sensitive people. It is one of the most common long-term illnesses in the world. Celiac disease was once thought to be an uncommon condition that only affected children of European descent. Millets, on the other hand, are gluten-free and have a lot of potential in foods and beverages that are safe for celiac disease sufferers. Therefore, millet grains and their fractions have the potential to be effective in cancer prevention and the production of gluten-free foods.

MILLET AND AGING

Millet grains are high in antioxidants and phenolics, although phytates, phenols, and tannins have been shown to contribute to antioxidant activity that is crucial for health, ageing, and metabolic syndrome. Nonenzymatic glycosylation, the chemical reaction between the aldehyde group of reducing sugars and the amino group of proteins, is a major factor in diabetes and ageing issues. Glycation and cross-linking of collagen were also prevented by methanolic extracts from finger millet and kodo millet. Therefore, there is potential usefulness of millets in the protection against aging.

CHALLENGES AND FUTURE PERSPECTIVES

Although millets have been proven to have nutritive value and potential health benefits comparable to major cereals such as wheat, rice, and maize, and processing procedures such as fermentation, soaking/malting, and fortification/supplementation have been discovered to increase their edible and nutritional properties, millet grain consumption is still primarily limited to rural populations at the household level. This is owing to a lack of novel millet processing technologies that can produce easy-to-handle, ready-to-cook, or ready-to-eat, and safe goods and meals on a commercial scale that can feed huge populations in cities. However, as the world's population grows, so will the demand for food, feed, and fuel. As a result, society will be pressed to increase agricultural production—whether by increasing yields on already cultivated lands or by cultivating currently uncultivated lands—or to alter current crop consumption patterns. In addition, higher yields must be accompanied by diversity of food production at both the national and household levels. One significant part of therapeutic dietary modification and boosting minor-grain food consumption is to provide more nutritious and traditional whole-grain and multigrain replacements for refined carbs. Gluten protein is well-known for its role in the production of easy-to-handle, high-quality bread items and other grain foods that require elastic and extensible dough. However, while millet grains are gluten-free, they appear unsuited for conversion into pure-millet bread and other easy-to-handle solid food products, according to the results of several laboratory investigations. As a result, using millet grains as a replacement in wheat composite flours, supplementary foods, and food blends appears to be the ideal technique for preparing nutritional, "healthy," and safe, high-quality, and shelf-stable food products on a home and commercial scale. Furthermore, unique processing technologies for decortication, milling, and other millet grain food preparation treatments are required to produce high-quality products on a commercial scale for urban consumers. In return, a reliable supply of high-quality millet grains for industrial purposes is required, as well as the creation of millet cultivars with high essential amino acid content. Future research studies should evaluate the nutritional content and potential health advantages of millet grains and fractions in animal and human models to support efforts to promote its use as food. Millets must also be recognized as functional foods and nutraceuticals since they supply essential nutrients such as dietary fibers, proteins, energy, minerals, vitamins, and antioxidants.

CONCLUSION

It is encouraging to note that the world is talking about depleting natural resources like arable land and water, and the pressing need to produce more to meet the food and nutritional requirements of the growing population. Rice and wheat are staple crops in our traditional diets, but they are also known to be water drainers, posing a challenge to farmers, consumers, and policymakers to find methods to diversify our cropping system. As a result, there is an urgent need to promote millets nutritional and environmental benefits to consumers, producers, and decision-makers to boost production efficiencies, R&D investments, and food sector linkages.

Additionally, the government and industry must encourage initiatives to diversify staples with millets, particularly in Asia and Africa. Returning to millets, which are hardy and climate smart, makes a lot of sense and is a vital answer that could be the turning point for several big health issues. In this direction, the United Nations General Assembly adopted an India-sponsored resolution to mark 2023 as the international year of millets. The declaration of 2023 as the 'International Year of Millets' will certainly support all these efforts and make millets a popular and healthy food choice.