

Nutri-Cereals A Magic Food -Know How!

Rondla Anitha^{1*}, Gottemukkula Bhavani², and Ch. Hema Malini³

¹Subject Matter Specialist (Home Science), ICAR-Youth for Action Krishi Vigyan Kendra, Mahabubnagar-I Madanapuram Mandal and Wanaparthy District
Telangana -509110

²Subject Matter Specialist (Agricultural Extension), ICAR-Youth for Action Krishi Vigyan Kendra, Mahabubnagar-I, Madanapuram Mandal and Wanaparthy District.
Telangana -509110

³Research Associate, Regional Agricultural Research Station, Vijayanagaram district.
Andhra Pradesh-535001

ARTICLE ID: 37

Abstract

Millets are one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. It is a short duration crop which requires limited amount of water for cultivation. Millets are best environment friendly crop besides as it is rich in effective nutrients it is been called as best nutritive food from decades. Millets have 65% carbohydrates, 9% proteins, 3% fat and 2-7% crude fiber and vitamins and minerals. Millets can be called as Nutri-cereals as it provides most of the nutrients required for proper human functioning that helps in reducing obesity and combating with many lifestyle diseases. Millets are alkaline and digests easily since these are gluten free and non-allergenic hence these are great sources for Celiac disease patients

Introduction

Nutri-cereals are known as one of the most important cereal grains. They are consumed by more than 1/3rd of the world's population. It is the 6th cereal crop produced worldwide. Nutri-cereals include Sorghum, Pearl Millet, Finger Millet (Ragi), Foxtail Millet (Korra), Proso Millet (Variga), Kodo Millet (Arika), Barnyard Millet (Ooda) and Brown top Millet (Andukorra). Nutri-cereals which economically friendly crop having characteristics like drought tolerance, photo-insensitive and resilient to climate change etc. Nutri-cereals are grown in arid and semi-arid tracts under low rainfall (200-600 mm) conditions.

Millets play a significant role in traditional diets in many regions. Millets possess unique nutritional characteristics specifically have complex carbohydrates, rich in dietary fiber, contains phenolic compounds and phytochemicals having medicinal properties. These

are 3 to 5 times high in their nutrition content when compared to nutritional content of widely used wheat and rice. Wheat and rice provide with security of food, besides millets provide securities like food, nutrition, livelihood, animal feed etc. Millets are natural source of iron, zinc and calcium which are used to combat the micronutrient deficiency in women and children. These are useful in managing lifestyle diseases like diabetes mellitus, hypertension, cardio-vascular diseases, hyperlipidemia etc. As millets contains non-acid forming property, it is easy to digest. It is well recognized that the incidence of diabetes mellitus and gastrointestinal tract related disorders are minimal among the population using these grains as staple food. (Kimeera and Sucharitha, 2019).

Why to consume millets?

Nutri-Cereals are highly nutritious, gluten free and contains non-acid forming property, hence they are considered as soothing and easy to digest food. As compared to rice, especially polished rice, millets release lesser percentage of glucose into the blood therefore, this lowers the risk of diabetes Mellitus and at the same time these are also high in minerals like magnesium, phosphorous and potassium which reduce the risk of cardiovascular diseases. Until 19th century people in southern India are least effected with metabolic disorders. But with changing lifestyle there come the change in food habits that leads to high rise in number of diabetes and cardiovascular cases. (Bommy and Kavitha, 2016). Hence, millets are recommend to be included in every day diet.

Types of Millets

Sorghum

Sorghum is one of the ancient staple cereal crops in India and Africa. It is considered as a safe food grain alternative for people with celiac disease, gluten insensitivity and rich in dietary fiber. Gluten is a protein which is present commonly in grains like wheat, barley and rye that gives them the chewy, springy quality when baked into breads.

Finger Millet

Finger Millet is one among the most nutritious cereal and is a good source of natural calcium (300-350 mg/100g) which helps for bone strengthening and helps in reducing the risk of bone fractures. It is also a good source of natural iron and helps in recovering anemia. Finger Millet is considered as a good nutritious food which can be replaced in place of rice and wheat. It is the store house of nutrients rich in proteins, Amino-acids, minerals and

vitamins. With its rich 22 percent fiber content, it is a good laxative and helps to prevent constipation. Similarly, it contains 19.7% insoluble dietary fiber and 2.5% soluble dietary fiber that helps in satiating hunger satisfaction and helps in management of obesity.

Finger Millet can be a great food for infants, elders and pregnant women due to its high calcium content. It is considered as one of the beneficial foods for lactating mothers as it helps in producing breast milk. It helps to increase the hemoglobin level that aids in fighting malnutrition and degenerative diseases (Reddy, 2017).

Pearl Millet

Pearl Millet consists of magnesium which helps in reducing the respiratory problems in asthma patients and also helps to reduce the effect of migraine. The fiber content of pearl millet helps in the reduction of gall stones. The insoluble fiber present in pearl millet help in reducing the excessive bile secretion in the body, as excessive bile in the body leads to formation of gall stones (Shweta, 2015).

Kodo Millet

Kodo millet is traditional food which closely resembles the rice and helps in weight loss. It is easily digestible and is rich in phytochemicals and antioxidants which helps in preventing lifestyle related diseases. It helps in reducing the joints and knee pain and aids in regularizing the menstruation cycle in women (Deshpande et al., 2015).

Proso Millet

Proso Millet has high content of Niacin which is beneficial in preventing Pellagra, which is caused due to deficiency of Niacin, Vitamin B3. Pellagra is a skin disease that causes the skin to become dry, scaly and rough (Jana Kalinova, 2007).

Foxtail Millet

Foxtail Millet helps in steady release of glucose without affecting the metabolism of the body. Foxtail millet reduces the prevalence of diabetes and it is also known as healthy heart food due to its good source of magnesium (Reddy, 2017).

Little Millet

Little Millet is highly nutritious and has good source of B-vitamins and minerals like calcium, iron, zinc and potassium. It also provides essential fats to the body, the kind that helps in weight loss (Reddy, 2017).

Nutri-Cereals – Nutrition

Nutri-cereals contribute substantially for food and nutritional security as these are highly nutritious. Millet crops perform well in dryland environments and are superior in nutritional properties with high micronutrient contents and with low glycemic indices. Millets are very good sources of carbohydrates, micronutrients and phytochemicals with nutraceutical properties. The millets contain 7-12% protein, 2-5% fat, 65-75% carbohydrates and 15-20% dietary fiber (Dayakar Rao et al., 2018).

Malnutrition is a primary symptom of hunger. Epidemiological studies have shown that diets rich in plant foods, including whole grains are protective against the non-communicable diseases like diabetes, cancer and cardiovascular diseases, due to protective effects of health promoting phytonutrients.

Millets are tasty, nut-like flavor and having higher amounts of fiber, B-complex vitamins including Niacin, Thiamine, Riboflavin and Vitamin E (Shadang and Jaganathan, 2014). These vitamins in millets play a key role in energy synthesis in the body (Sarita et al., 2016). Millets are good sources of essential amino acids except for lysine and threonine but are relatively high in Sulphur containing amino acids like methionine and cystine (Singh et al., 2012).

Anti-nutrients in millets

Phytic acid, Polyphenol, Cyanogenic glucoside, tannins, oxalates, amylase inhibitor are some of the anti-nutrients found in millets. These anti-nutrients reduce the bioavailability of nutrients in the body. The proportions of these anti-nutrients can be reduced in the meals by adopting some household food processing techniques like fermentation, malting, germination, decortications etc, which improve the bioavailability of nutrients (Sarita and Singh, 2016).

Table 1 Processing techniques to overcome the effect of anti-nutrients in millet-based meals.

S.No.	Processing techniques	Function
1.	Soaking	<ul style="list-style-type: none"> • Reduce the amount of phytic acid and polyphenolic compound • Improve the protein digestibility
2.	Germination	<ul style="list-style-type: none"> • Decrease the level of tannins (1.6% to 0.83%)

		<ul style="list-style-type: none"> • Increase bioavailability of minerals such as calcium, iron and zinc
3.	Fermentation	<ul style="list-style-type: none"> • Provides many varieties of food products with different flavors and texture • Decrease the levels of anti-nutrients and improves the protein availability

Millet – the best vehicle for fortification

Fortification is the cheapest, easiest, and best way to combat micronutrient deficiencies which is the major problem in India. Millet being less expensive compared to other cereals and staple food for the downtrodden people, hence millets fortified foods could be chosen as the best supplements. Millets such as finger millet, pearl millet, barnyard millet are some of the millets that are used in various food items. Millets can be incorporated into bakery products as well and it is nutritious than refined flour. A study reported that finger millet flour can effectively be used as a vehicle for zinc fortification to derive additional amounts of bio accessible zinc, with good storage stability and to combat zinc deficiency. (Shadang et al., 2014).

Health Benefits of Nutri-cereals

Millets – Obesity

Obesity is the biggest emerging problem in India, and it is associated with several chronic diseases including diabetes and cardiovascular diseases. Recent studies show that intake of high dietary fiber decreases the incidence of obesity. Foods rich in dietary fiber improves the bowel function and slows the process of digestion and absorption, thereby reducing the risk of chronic diseases. The dietary fiber content present in millets is 22% which is comparatively higher than other cereals like wheat and rice (Shobana and Malleshi., 2007)

Millets – Diabetes

Millets reduces the α -glucosidase and pancreatic amylase thereby reducing the postprandial hyperglycemia by reducing the enzymatic hydrolysis of complex carbohydrates. Hence consuming millets helps in controlling the blood glucose levels (Rajasekaran et al., 2004).

Millet helps in prevention of type II diabetes due to their significant levels of magnesium. Magnesium is an important mineral which helps in increasing the efficiency of insulin and glucose receptors by producing many carbohydrate digesting enzymes, which manages insulin action (Reddy, 2017).

Millets – Cardio-Vascular Diseases

Millets are rich source of magnesium, which is an important mineral for reducing blood pressure and the risk of heart attacks, particularly in the case of atherosclerosis. Millets are also a great source of potassium, which further keeps blood pressure low by acting as a vasodilator. Reducing the blood pressure and optimizing the circulatory system is one of the best ways to protect cardiovascular health (Kimeera and Sucharitha, 2019).

Millets are also rich in Phyto-chemicals which contains phytic acid helping in lowering cholesterol and preventing cardiovascular disease by reducing plasma triglycerides (Lee et al., 2010). Studies suggested that regular consumption of whole millet grains reduces the risk of Cardio-Vascular Diseases.

Millets – Cancer

Millets are rich in phenolic acids, phytates and tannins which are the antinutrients that help in reducing the risk of colon and breast cancer (Chandrasekara and Shahidi, 2011).

Millets – Celiac Disease

Celiac disease is a genetically susceptible problem triggered by the consumption of gluten, a protein found in cereals like wheat and rye that gives sticky nature to the food products like chapathi, roti, parota etc. As the millets are gluten free, they help in reducing the celiac disease by reducing the irritation caused by the common cereal grains which contain gluten (Saleh et al., 2013).

Millets – Phytochemicals

Millets are good source of phytochemicals and micronutrients. Phytochemicals like phenolics, sterols, lignans, resistant starch, β -glucan, phytates, tocopherol, dietary fiber and carotenoids are present in millets. The polyphenols are the phenolic acids and tannins, flavonoids are present in small quantities, which act as antioxidant and play a role in protection of body's immune system (Chandrasekhara and Shahidi, 2010).

Millets – Development and Repair of Body Tissue.

Millets contain phosphorous that plays a major role in cell structure developments. In addition to its role in forming the mineral matrix of bone besides it is an essential component of numerous compounds including adenosine triphosphate (ATP), the molecule that is the energy currency of the body. Phosphorous is an important component of nucleic acids, the building blocks of the genetic code. In addition to the metabolism of lipids, phosphorous is an essential component of lipid-containing structures such as cell membranes and nervous system structures.

References

- Bommy, D and Kavitha Maheswari, S. 2016. Promotion of Millets Cultivation through Consumption. *International Journal of Current Research and Academic Review*. 3:74-80.
- Chandrakara, A and Shahidi, F. 2010. Content of Insoluble Bound Phenolics in Millets and their contribution to Antioxidant Capacity. *Journal of Agricultural Food Chemistry*. 58: 6706-6714.
- Chandrakara, A and Shahidi, F. 2011. Antiproliferative Potential and DNA scission inhibitory activity of phenolics from whole millet grains. *Journal of Functional Foods*. 3:159-170.
- Dayakar Rao, B., Venkatesh Bhatt, B and Tonapi, V. A. 2018. Nutri-Cereals for Nutritional Security. ICAR_Indian Institute of Millets Research (IIMR). 164.
- Deshpande, S. S., Mohapatra, D., Tripathi, M. K and Sadvatha, R. H. 2015. Kodo Millet – Nutritional Value and Utilization in Indian Foods. ICAR – Central Institute of Agricultural Engineering. *Journal of Grain Processing and Storage*. 2:16-23.
- Jana, K. 2007. Nutritionally Important Components of Proso Millet (*Panicum miliaceum* L.). Global Science Books. 1(1):91-100.
- Kimeera, A and Sucharitha, K. V. 2019. Millets – Review on Nutritional Profiles and Health Benefits. *International Journal of Recent Scientific Research*. 10(7):33943-33948.
- Lee, S. H., Chung, I. M., Cha, Y. S and Parka, Y. 2010. Millet consumption decreased serum concentration of triglyceride and C-reactive protein but not oxidative status in hyperlipidemic rats. *Nutrition Research*. 30:292-296.



- Rajasekaran, N. S., Nithya, M., Rose, C and Chandra, T. S. 2004. The Effect of Finger Millet feeding on the early responses during the process of wound healing in Diabetic rats. *Biochemical et Biophysica*. 1689:190-201.
- Reddy, O. S. K. 2017. Smart Millet and Human Health. *Green Universe Environmental Services Society*.
- Saleh, A. S. M., Zhang, Q., Chen, J and Shen. 2013. Millet grains: Nutritional quality, processing and potential health benefits. *Comprehensive reviews in Food Science and Food Safety*. 12:281-295.
- Sarita, E. S and Singh, E. 2016. Potential of Millets: Nutrients Composition and Health Benefits. *Journal of Scientific and Innovative Research*. 5(2):46-50.
- Shadang, C and Jaganathan, D. 2014. Millet – The Frugal Grain. *International Journal of Scientific Research and Reviews*. 3(4): 75-90.
- Shobana, S and Malleshi, N. G. 2007. Preparation and Functional Properties of decorticated finger millet (Eleusine Coracana). *Journal of Food Engineering*. 79:529-538.
- Shweta, M. 2015. Pearl Millet – Nutritional Value and Medicinal Uses. *International Journal of Advance Research and Innovative Ideas in Education*. 1(3): 414-418.
- Singh, K. P., Mishra, A and Mishra, H. N. 2012. Fuzzy Analysis of Sensory Attributes of Bread prepared from Millet based Composite Flours. *Food Science Technology*. 48:276-282.