

Review Article

A Review on Nutritional Properties and Health Benefits of Finger Millet for Healthy Life

ABSTRACT

Finger millet (*Eleusine coracana*) is one of the important small millets with high nutraceutical value in the world. Wide adaptability of finger millet in different types of soil, climate, at. It also grows well in hot climates with short rainfall periods and cool climates with warm millets. A multitude of small farmers grow finger millet with limited water resources and in many countries this crop is often referred to as “poor people's crop”. Finger millet is considered as rich sources of calcium and iron in other cereals. Diet is a major focus of public health strategies aimed at maintaining optimum health throughout life, thus preventing early onset of chronic diseases as well as promoting healthier ageing. Many researchers have described that finger millet helps in natural weight loss, strengthens bone, prevents diabetes, prevents anti-ageing , maintains blood pressure levels, protects from disease, improves in hemoglobin status in children etc.,. Studies on the different properties of foods have shown that consumption of certain foods may provide greater health benefits. Finger millet is not only used for human consumption, but it is also used as feed for cattle and birds. Finger millet is used in the preparation of different foods both in natural and malted forms, like porridge, puddings, pancakes, biscuits, roti, bread, noodles, and other snacks. Besides this, it is also used as a nourishing food for infants when malted and is regarded as wholesome food for diabetic patients. Therefore, necessary need to needs to increase production and productivity through various improved technologies to meet our requirements in future and also strengthen public distribution system for achieving nutritional security.

Key Words: Finger millet, nutrients, minerals, health benefits

INTRODUCTION

Finger millet (*Eleusine coracana* (L.)) is one of the important small millet grown in India. It is a staple food in Southern India and the country's hilly areas and commonly called ragi. It is also a good source of calcium (0.344%) and free of gluten. Generally, it is used to make cakes, puddings, and porridge etc. Straw is used for both draught and milch animals. It has a lot of

nutritional value and is beneficial, particularly for people suffering from diabetes, liver illness, high blood pressure, cardiac blood pressure, heart weakness, and asthma.

Finger millet can be successfully grown in the tropics and subtropics, at sea level to an altitude of 2,300 m on hill slopes and plains. It needs less water and is cultivated in places where rainfall can reach 100 cm. In some locations with better rainfall and irrigation, seedlings are transplanted like rice. In south India, it is also grown during both *summer* and *rabi* season, and in north India it is mostly during the *kharif* season. The temperature range of 26-30°C is ideal for optimum development and yield of ragi. If the temperatures below and above 20°C limit the yield of crops. The crop is drought tolerant yet extremely vulnerable to frost.

Status of Finger millet in world

Finger millet grows in more than 25 countries in Africa and Asia. Finger millet is native to the Ethiopian region of Africa. The world's top finger millet producers are Uganda, India, Nepal, and China. Ragi is a widespread millet in many parts of India. It has historically been a significant millet staple meal in portions of eastern and central Africa and is also frequently known as Koracan in Sri Lanka and by other names in Africa [2] . In East-Africa and South-East-Asia this minor cereal is a staple food for a large segment of low income group populations [1]. India is the major producer of finger millet contributing nearly 60% of the global production [14] . In India, finger millet is being cultivated in an area of 1.01 million hectares with a total production of 1.67 million tonnes and a yield of 1747 kg/ha. It is widely cultivated in India's hilly areas of Uttar Pradesh and Himachal Pradesh, as well as Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Bihar, Gujarat, and Maharashtra. It is better adapted in higher rainfall areas (600-1,200 mm) particularly to acid soils and matures within 100-130 days. One of the important features of this millet is its ability to adjust itself in different agro-climatic conditions which reflects it having the highest productivity among millets [10, 29] .

Adoptability of finger millet

Finger millet (*Eleusine coracana* G.) is an important food grain crop of the semi-arid tropics, particularly of India and East Africa [8] . Finger millet is grown all over the country owing to its wide adaptable capacity. Extremely tolerance to prolonged periods of drought and moisture

scarcity increases their importance in food security. It belongs to the orphan crop group, widely cultivated in the past for its high energy value, and is currently cultivated in limited geographical regions. Millets are water-saving, drought-tolerant crops. Attributed to its C4 nature, they are resilient [22] .

It is considered as the storehouse of nutritional properties and a potential solution for malnutrition and hidden hunger as it has high nutritive value and is superior to other cereals. India is the major producer of finger millet, contributing nearly 60% of global production. Finger millet continues to grow widely in tropical and sub-tropical areas and also under severe drought and osmotic stress conditions [1] .

Finger millets in daily food

The use of finger millet as a dietary supplement is increasing in parallel with research on its multitudinous effects on human health. It is one of the oldest foods known to humans and possibly the first cereal grain used for domestic purposes. In India, millets have been used as a staple food for thousands of years. Today, millet ranks as the sixth most important grain in the world, sustains 1/3 of the world's population and is a significant part of the diet in northern China, Japan, Manchuria and various areas of the former Soviet Union, Africa, India, and Egypt [7,26] . It is often considered to be a "poor men's cereal" as it does not require fertilizer input. Indeed, it is one of the few special species that currently support the world's food supplies and has become a more mainstream supplement to the diet nowadays. It is highly nutritious and considered to be one of the least allergenic and most digestible grains. Ragi grain possesses excellent storage properties and is said to improve in quality with storage. However, a number of studies showed that they are highly valued as a reserve food in times of famine and can be stored without damage up to 50 years [13] . Finger millet is used in the preparation of different foods both in natural and malted forms, like porridge, puddings, pancakes, biscuits, roti, bread, noodles, and other snacks. Besides this, it is also used as a nourishing food for infants when malted and is regarded as wholesome food for diabetic patients [1] .

Nutritional composition of ragi

According to research, consuming whole grains and cereal fibre is inversely related to BMI, waist circumference, total cholesterol, metabolic syndrome, cardiovascular disease mortality,

insulin resistance, and type 2 diabetes incidence [2] . Consumption of millets, in general, was higher in Gujarat (maize and pearl millet), Maharashtra (sorghum) and Karnataka (finger millet) but almost nonexistent in Kerala, West Bengal, Orissa, and Tamil Nadu, where rice is the main staple food (National Nutrition Monitoring Bureau, NNMB, 2006). Gujarat and Maharashtra used more millets per capita than Karnataka, Madhya Pradesh, and Andhra Pradesh (75, 32 and 16 g/CU/day, respectively; the consumption unit is a coefficient). Orissa (1 g/CU/day) and Tamil Nadu (3 g/CU/day) reported low levels of consumption [2] . Consumption of finger millet increases every year (Fig. 1), as all are aware of the importance of finger millets in maintaining good health and a long life.

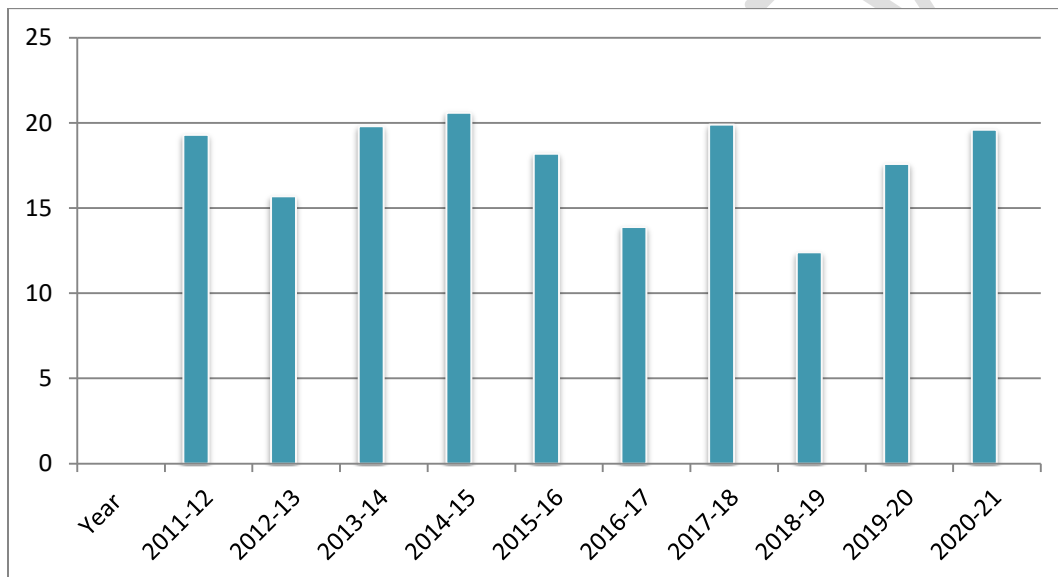


Fig. 1. Millet consumption (g/day) in India

Its crude fiber and mineral content is remarkably higher than those of wheat (1.2% fiber, 1.5% minerals) and rice (0.2% fiber, 0.6% minerals); its protein profile is relatively well balanced; as it contains more lysine, threonine, and valine than other millets [24] . In addition to this, black finger millet contains 8.71 mg/g dry weight fatty acid and 8.47 g/g dry weight protein. Finger millet varieties contain calcium (220–450) and iron (3–20%) respectively. The finger millet contains important amino acids viz., isoleucine (4.4 g), leucine (9.5 g), methionine (3.1 g) and

phenyl alanine (5.2 g) which are deficient in other starchy meals. Millets also contain B vitamins, especially niacin, B6 and folic acid, calcium, iron, potassium, magnesium and zinc [22] .

Though Indians continue to consume cereals as the main staple providing 70–80% of total energy intake in the majority of Indian diets [11]. The consumption of millets is very low compared to rice and as evident by our recent study on dietary profile of urban Indians (from the Chennai Urban Rural Epidemiology Study (CURES)) which revealed that, the millets contributed to only about 2% of total calories (6.7 g/d) [19] while almost half of the daily calories were derived from refined grains such as polished white rice (253.4 g/day) [20] .

Carbohydrate-72-79.5%, protein-7%, ash-1.7-4.13%, Ca-162-487mg%, Fe-3.61 mg/100 mg-5.42mg% [18] ., carbohydrates -72.6gm, protein-7.7gm, fat-1.5gm, crude fiber-3.6gm, ash-2.7gm, calcium-344mg, phosphorous-250gm, iron-6.3gm (Amir et al.), carbohydrate-72.6 gm, protein-7.7gm, crude fibre-3.6gm, mineral-2.7%, fats-1.5gm, ash-2.6gm, energy(Kcal)-336, Ca-350mg, Fe-3.9mg, thiamin-0.42mg, Niacin- 0.19mg, riboflavin-1.1mg (100gm dry.wt finger millet, 12%moisture) [22] ., protein-9.2%, fat-1.29%, carbohydrates-76.32%, minerals -2.2%, ash-3.9%, calcium-0.33%[8]. Raw ragi contains moisture 11.14 %, protein 6.12 %, fat 1.06%, ash 2.13%, carbohydrate 79.52%, starch 69.26 % and total sugar 1.33% [17]. The raw ragi flour had good amounts of crude protein (4.6%), crude fat (3.06%) and crude fibre (14.8%). Amounts of amino acids were on the higher side i.e. tryptophan (116.77mg/100g protein), methionine (181.56mg/100g protein) and lysine (195.67mg/100g protein), as well as total sugars (5.32g/100g) and starch (0.82g/100g). Malting of ragi enhanced the crude protein (7.11%), ash (4.13%), tryptophan (250.13mg/100g protein) and methionine (351.1mg/100g protein) content [16]. Ragi is a versatile crop with a high nutrient profile of protein (6-8%), fat (1.3%), calcium (296 mg), carbohydrate (70-76%), lysine (2.86%), tryptophan (1.39%) and methionine (2.86%) [3].

Health benefits of Finger millets

Scarcity of protein-rich food and food supplements are responsible for protein-energy malnutrition particularly among children and lactating women in developing countries like India. The World Health Organization (WHO) has identified 4 major forms of malnutrition crippling globally [31]. This includes vitamin-A deficiency, iron deficiency, iodine deficiency and protein

energy malnutrition. Millets are a storehouse of nutrients and are a remedy for the malnutrition that affects a vast majority of our population. It has intensive multifunctional importance (Table 1). Millet Network of India (Deccan Development Society, FIAN, India) confirmed in their study that, as compared to the other crops (rice and wheat), it is an exceptionally rich source of calcium chromium, zinc, copper and magnesium, essential for good health. It is a rich source of non-available carbohydrates with a low glycemic index, which is beneficial for prevention of diabetes and cardio-vascular diseases. It also helps in delaying ageing by reducing glycosylation of body proteins [12]. Besides, it contains essential amino acids and its functions are given in Fig.2.

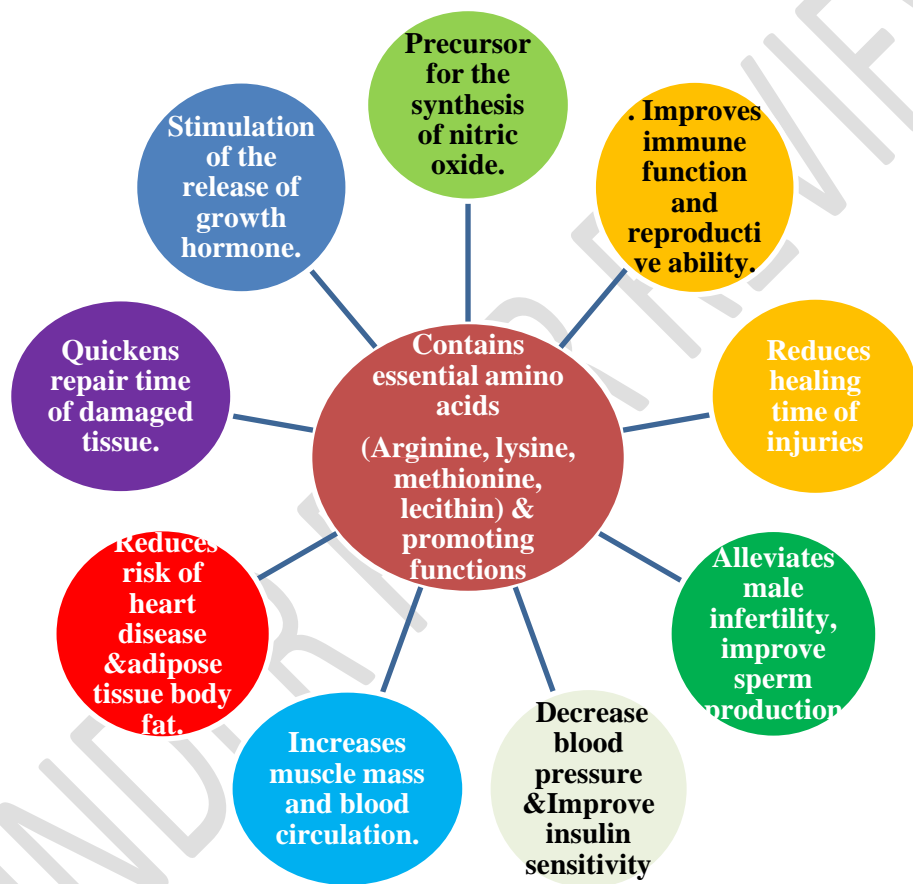


Fig. 2. Essential amino acids presents in Ragi contains and its functions [9]

Table 1. Health Benefits of ragi

S.No.	Benefit	Reference
1.	Natural weight loss: Contain more fibre and Tryptophane, Lowers your body's blood sugar levels and converts it to insulin	[1]

2.	Strengthen bone : Contains significant amount (344 milligrams) of calcium, important for bone growth	[1]
3.	Prevent diabetes: high concentration of dietary fibre and polyphenols, stabilise your blood sugar level, it absorbs starch and decreases your body's ability to digest it. : low glycemic index value: slow down the rate of glucose absorption, which lowers insulin demand	[1,22]
4.	Anti-ageing agent: contains crucial amino acids like methionine and lysine that shield your skin against the hazards of rashes, wrinkles, and dullness. Contains antioxidants that assist your body battle stress and delay the onset of ageing. contains E which is excellent for your skin	[1, 21]
5.	Maintain blood pressure level: High fiber content, low glycemic index value, improve aortic fragility and elasticity by attenuating elevation of blood pressure and they increase vaso-relaxation	[26]
6.	Protect from disease: anti-inflammatory, antiviral, anticancer and platelet aggregation inhibitory activity	[4,28]
7.	Improvement on hemoglobin status in children: It contains more Iron and Calcium	[25,5]
8.	Natural probiotic: Used as treatment for diarrhea	[15]
9.	Improve Digestibility: Unique property of slower digestibility thereby it is a very good food crop for pregnant women and person who suffering from diabetes.	[30]
10.	Boost Lactation : It contains more amino acid, calcium and iron which are also beneficial for the child.	[31]

CONCLUSION

Cereals and millets are the main sources of food not only for India but also in foreign countries. Among the many millets, finger millet is an important staple food in parts of eastern and central Africa and India and it is considered as a poor people's crop. It plays a vital role in maintaining good health, because it includes health benefits due to the presence of several vitamins and

minerals. It is easy to digest. Now the trend has changed and consumption of ragi is increasing in the past few decades. Further wide adoptability of finger millet to soil and climate attract to cultivate many region in the world. The products made from composite flours are nutritionally superior to their respective controls and can be successfully used for supplementary feeding programmes. Efforts should be made to educate people about the nutritive value and health benefits of finger millet and its food products. Therefore, it is necessary to take steps to increase production and productivity through various improved technologies to meet our requirements in future.

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