

## The Promising Health Benefits and Nutritional Facts of Finger Millet as Nutri-Cereal

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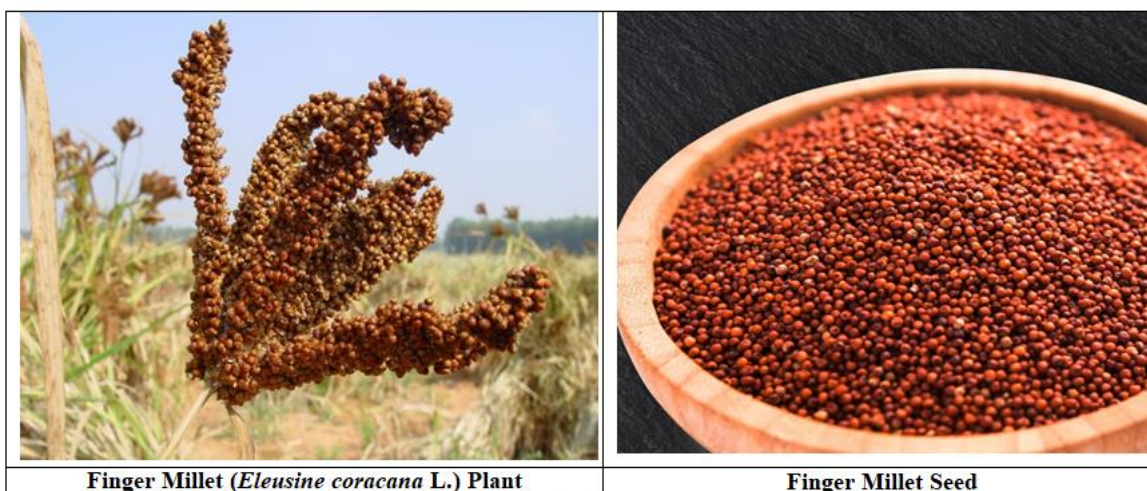
### INTRODUCTION

Finger millet, also known as Ragi, is a nutrient-dense cereal that has been a staple food in India for centuries. It has gained popularity in recent years as a "nutri-cereal" due to its impressive health benefits and nutritional content. Millet grains have significant advantages as a drought-resistant crop, produce high yields in water-scarce regions, have outstanding edible and nutritional qualities, and are simple to process and manufacture into food. Agricultural and food security policymakers in developing nations should stimulate research on millet processing, food manufacture, nutrient value enhancement, and potential health advantages in order to increase millet use as a food source in their respective countries. Finger millet is well-known for its health advantages, some of which are attributable to its polyphenol and dietary fibre content. It is an important staple crop for low-income families living in India. Its nutritional significance is widely recognised due to its high calcium (0.38 %), dietary fibre (18 %), and phenolic compound (0.03 - 3 %) content. In addition, they are known for their anti-diabetic, anti-tumorigenic, atherosclerogenic, antioxidant, and antimicrobial activities. Millets are rich in antioxidants, including soluble and insoluble dietary fibres, phenolic acids, and glycosylated flavonoids. Their anti-diabetic, anti-tumorigenic, atherosclerogenic, anti-oxidant, and antibacterial activities are also universally acknowledged.

Finger millet (*Eleusine coracana* (L.) Gaertn) is a cereal grass grown mostly for its grain (Fig. 1). Finger millet is a robust, tufted, tillering annual grass, up to 170 cm high. The inflorescence is a panicle with 4-19 finger-like spikes that resembles a fist when mature, hence the name finger millet. The spikes bear up to 70 alternate spikelets, carrying 4 to 7 small seeds. The seed pericarp is independent from the kernel and can be easily removed from the seed coat. Finger millet is a staple food in many African and South Asian countries.

It is also considered a helpful famine crop as it is easily stored for lean years. The grain is readily digestible, highly nutritious and versatile, and can be cooked like rice, ground to make porridge or flour, or used to make cakes. Sprouted grains are recommended for infants and elderly people. Finger millet is also used to make liquor and beer, which yields by-

products used for livestock feeding. Finger millet grain is not widely used for livestock: it is primarily a food grain, but it is of lesser quality for livestock than maize, sorghum and pearl millet. In India, it is sometimes used for feeding infant calves, growing animals, as well as sick and convalescing animals.



Finger Millet (*Eleusine coracana* L.) Plant

Finger Millet Seed

Fig. 1

### Nutritional Importance of Finger Millet

The annual plant known as finger millet is mostly cultivated in Africa and Asia for the purpose of producing a cereal crop. In Karnataka, it continues to be a primary component of the basic diet that is consumed there. In terms of nutrition, finger millet is an excellent source of nutrients, particularly calcium, as well as other minerals and fibre. There have been reports that the total carbohydrate content of finger millet falls somewhere in the range of 72.5 to 79.5%. The starch makes up the majority of the carbs, which range from 59.4 to 70.2% of the total. The form of finger millet starch granules can be described as polygonal rhombic. Amylopectin makes up around 80–85% of the starch in finger millet, whereas amylose accounts for the remaining 15–20% of the starch. Finger millets contain anywhere from 20 to 30 percent of their total carbohydrates in the form of a non-starch polysaccharide. It has approximately 1.5% reducing sugar and 0.03% non-reducing sugar in its composition. In terms of the protein content, the white types of

finger millet have a distinct advantage over their brown counterparts. The percentage of essential amino acids that are present in finger millet is greater than the average of 33.9%, coming in at 44.7% of the total amino acids. Those who are sensitive to gluten can benefit greatly from consuming ragi as an alternative grain because it does not contain any gluten. It was discovered that finger millet had 12, 11, and 2% of total dietary fibre, insoluble dietary fibre, and soluble dietary fibre, respectively. TDF stands for total dietary fibre, IDF stands for insoluble dietary fibre, and SDF stands for soluble dietary fibre. It was found that finger millet had a dietary fibre content of 18.6% and a crude fibre content of 3.6%. Foods that are high in fibre have a number of positive health effects, including a barrier that prevents digestion, delayed nutrient absorption, increased faecal bulk, a reduction in blood lipids, prevention of colon cancer, and mobility of intestinal contents. They also increase the amount of time it takes for faeces to pass through the digestive tract.

Because it is rich in the appetite-suppressing amino acid tryptophan, finger millet is an excellent choice for those trying to lose weight but yet maintain their energy levels. The total antioxidant capacity of finger, tiny, foxtail, and proso millets was discovered to be greater, while the total carotenoids concentration of the millet species ranged from 78–366 mg/100 g. The amount of calcium (344 mg) and potassium that is found in finger millet is the highest (408 mg). Calcium plays an important role in maintaining bone and tooth health. In comparison to white rice, which is the predominant form of grain consumed in India today, it has a greater concentration of nutritional fibre, minerals, and amino acids containing sulphur. However, finger millet also contains phytates (0.48 percent), polyphenols, tannins (0.61 percent), trypsin inhibitory factors, and dietary fibre. These components, which once were thought of as "anti-nutrients" due to the metal chelating and enzyme inhibition activities they possessed (Thompson, 1993), are now referred to as nutraceuticals in modern parlance. It is now well-established that phytates, polyphenols, and tannins can contribute to the antioxidant activity of foods containing millet. Antioxidant activity is a crucial element in health, as well as ageing and metabolic disorders. It helps combat restlessness, a sleeping issue, and feelings of despondency in addition to functioning as a wonderful common relaxant. In addition, it is helpful in the treatment of headaches and brain pains. The effects of finger millet's antioxidants on the dermal wound healing process in diabetic rats with oxidative stress-mediated modulation of inflammation were studied. They reported the influence that feeding finger millet had on skin antioxidant status, generation of nerve growth factor (NGF), and wound healing parameters in the process of mending impaired early diabetic rats.

#### **Health Benefits of Finger Millet**

❖ Finger millet also is known to have several potential health benefits. Some of the

health benefits are attributed to its polyphenol contents. The phenolic acid content of brown finger millet 96% higher compared to white variety

- ❖ It contains more lysine, threonine, and valine than other millets. In addition, black finger millet contains 8.71 mg/g dry weight fatty acid and 8.47 g/g dry weight protein
- ❖ Finger millet is reported to have anti-ulcerative properties and finger millet diets lowered blood glucose and cholesterol in diabetic rat models (36% reduction in blood glucose levels)
- ❖ In diabetic rat models induced by streptozotocin, it was discovered that the finger millet seed coat matter, which is a rich source of dietary fibre and phenolic compounds, exhibited blood glucose and cholesterol lowering properties, as well as nephron-protective and anti-cataractogenic properties. These findings were made using rat models.
- ❖ A general improvement in the infants' haemoglobin status was seen when they were given germinated finger millet-based diet as a supplement.
- ❖ Decreased levels of blood cholesterol and triacylglycerol, in comparison to diabetes controls (by 43 and 62%, respectively)
- ❖ In 'in vitro' studies, it was found that extracts of finger millet possessed features such as free radical scavenging, anti-protein glycation, anti-cataractogenicity, and antibacterial activity. In 'in vitro' studies, phenolic compounds from finger millet were found to inhibit snake venom phospholipases.
- ❖ As compared to the polyphenol extract obtained from finger millet whole flour, the polyphenol extract from the seed coat possesses a high reduction power. There is a significant difference in the levels of antioxidant activity between the polyphenol extract from finger millet whole wheat (27%) and the polyphenol

extract from the seed coat of finger millet (86%).

- ❖ Facilitated in preventing mucosal ulcers, epithelialization, enhanced collagen synthesis, stimulation of fibroblasts, and mast cell production.
- ❖ Promotes Weight Loss: Finger millet is a low glycemic index food, which means it can help control blood sugar levels and reduce food cravings, promoting weight loss.
- ❖ Improves Digestion: The high fiber content in finger millet helps regulate bowel movements and prevent constipation, promoting healthy digestion.
- ❖ Prevents Anemia: Finger millet is a good source of iron, which is essential for the production of red blood cells. Consuming finger millet regularly can prevent anemia and improve overall blood health.
- ❖ Boosts Bone Health: Finger millet is rich in calcium and other essential minerals, making it beneficial for bone health. Consuming finger millet regularly can prevent bone diseases like osteoporosis.
- ❖ Reduces Risk of Diabetes: Finger millet has a low glycemic index and is rich in fiber, which helps regulate blood sugar levels and reduces the risk of developing type 2 diabetes.
- ❖ Promotes Heart Health: Finger millet is rich in antioxidants, which can help reduce the risk of cardiovascular diseases by preventing the buildup of plaque in the arteries.
- ❖ Enhances Immunity: Finger millet is a good source of vitamins and minerals that are essential for a healthy immune system. Consuming finger millet regularly can enhance overall immunity and prevent infections.

### Nutritional Facts of Finger Millet

The health advantages of finger millet are numerous due to the grain's high nutrient content. The following is an overview of the nutritional profile of finger millet.

- ❖ ***Finger millet/ Ragi for losing weight:*** Tryptophan, an amino acid found in ragi, reduces hunger and aids in weight management. Ragi's slower rate of digestion prevents one from consuming too many calories. Additionally, the fibres in ragi make you feel full, which helps you avoid overeating.
- ❖ ***Finger millet/ Ragi for bone health:*** ragi is loaded with calcium, a mineral that is essential to the maintenance of healthy bones and teeth. Both younger people who are still growing and elderly people can benefit greatly from this natural supply of calcium. The use of ragi is beneficial to both the maintenance of adult bone health and the growth of bone in young children. The consumption of ragi protects against conditions such as osteoporosis and may reduce the likelihood of breaking a bone.
- ❖ ***Finger millet/ Ragi for diabetes:*** Finger millet has phytochemicals that aid to slow down the digestion process, which is beneficial. This contributes to the management of blood sugar levels that are associated to diabetes. According to research from the year 2000, include finger millet in one's diet, which has higher fibre content than both rice and wheat, may be beneficial for diabetes. In addition, the research showed that a diet that is predominately composed of whole finger millet had a lower glycemic response, which indicates that it has less of an ability to cause an increase in one's blood sugar levels. This is due to the fact that ragi flour consists of components that slow down the digestion and absorption of starch.
- ❖ ***Finger millet/ Ragi for lowering blood cholesterol:*** Lecithin and methionine are two amino acids that can be found in finger millet. These amino acids help reduce cholesterol by eliminating excess fat from the liver, which is how they work. Moreover, finger millet contains the amino acid threonine, which inhibits the

accumulation of fat in the liver and reduces the levels of cholesterol in the blood.

- ❖ **Finger millet/ Ragi for anaemia:** It is possible that ragi contains a significant amount of iron that is present in its natural state. Intake of ragi is therapeutic for patients suffering from anaemia.
- ❖ **Finger millet/ Ragi for relaxation:** Eating ragi has been shown to facilitate a more relaxed state of mind and body. Those who suffer from anxiety, depression, and insomnia can benefit from its use (sleepless nights). Migraine sufferers may benefit from the use of ragi.
- ❖ **Finger Millet/ Ragi for Protein/ Amino Acids:** Ragi has a good amount of amino acids, which are needed to repair the body and keep it running normally. Finger millet has the amino acids Tryptophan, Threonine, Valine, Isoleucine, and Methionine. Isoleucine is good for your skin, helps your muscles recover, and helps make blood and bones. Valine is a necessary amino acid that speeds up the metabolism, helps muscles work together, and helps the body heal itself. It helps keep the nitrogen balance in the body. Methionine is another essential amino acid that isn't found in most cereals. It is important for a number of body functions, helps get rid of fat, and is the main source of sulphur for the body. Glutathione, the body's own antioxidant, is made with the help of sulphur.
- ❖ **Finger Millet for other health conditions:** When used regularly, ragi can help prevent malnutrition, diseases that get worse over time, and getting old quickly. Green ragi is

good for people with high blood pressure, liver problems, asthma, and weak hearts. Green ragi is also recommended for nursing mothers whose milk supply is low.

- ❖ **Ragi** is a very healthy cereal that can help keep your health in check. But a lot of oxalic acid could be made in the body if a lot of oxalate is eaten. Because of this, people with kidney stones are not told to do so (Urinary Calculi). Ragi can be cooked and eaten in many different ways. Ragi Roti, Ragi Dosa, Ragi Porridge, Ragi Upma, Ragi Cakes, and Ragi Biscuits are some of the most well-known Ragi delights.

### CONCLUSION

In conclusion, finger millet is a highly nutritious grain that has a wide range of health benefits. It is an excellent source of fiber, protein, minerals, and vitamins, including calcium, iron, and B-complex vitamins. The nutritional profile of finger millet makes it an ideal food for people of all ages, including children, pregnant women, and the elderly. The consumption of finger millet has been linked to a variety of health benefits, such as managing diabetes, reducing cholesterol levels, improving digestion, and promoting healthy bones. Additionally, it has been shown to have antioxidant and anti-inflammatory properties, which may help reduce the risk of chronic diseases such as cancer, cardiovascular disease, and Alzheimer's disease. Finger millet is also a versatile ingredient that can be used in a variety of dishes, such as porridges, pancakes, and bread. As a gluten-free grain, it is a good option for people with celiac disease or gluten intolerance.