

RAGI (FINGER MILLET): AN ANCIENT GRAIN WITH MODERN APPLICATIONS - REVIEWING ITS POTENTIAL IN ADDRESSING CONTEMPORARY HEALTH CHALLENGES

Rajesh^{1*}, Mumtaz Ahmad², Mohd. Manzar Alam¹, Mohd. Tariq¹, Zikra Tahseen A.³, Chandramani Yadav⁴

¹Research Officer (U), Scientist-2, Regional Research Institute of Unani Medicine, Patna.

²Deputy Director, Regional Research Institute of Unani Medicine, Patna.

³Research Officer (U), Scientist-1, Regional Research Institute of Unani Medicine, Patna.

⁴Investigator (Statistics), Regional Research Institute of Unani Medicine, Patna.



*Corresponding Author: Dr. Rajesh

Research Officer (U), Scientist-2, Regional Research Institute of Unani Medicine, Patna, CCRUM, Ministry of AYUSH, Govt. of India.

Article Received on 23/01/2024

Article Revised on 12/02/2024

Article Accepted on 03/03/2024

ABSTRACT

Ragi (Finger millet), scientifically known as *Eleusine coracana*, is a nutritious grain with origins tracing back to Africa, particularly the Ethiopian highlands. Over millennia, it has spread to various regions worldwide, including India and Southeast Asia, where it has become an integral part of traditional agriculture and cuisine. One of the key features of ragi is its impressive nutritional profile. It is rich in calcium, iron, dietary fiber, and other essential nutrients, making it a valuable addition to a balanced diet. Ragi's high nutritional content, coupled with its gluten-free nature, makes it particularly beneficial for individuals with dietary restrictions or specific health needs. Its versatility in culinary applications further enhances its appeal as a nutritious food source. It stands as a testament to the resilience and adaptability of traditional grains, offering not only sustenance but also nutritional and cultural significance to communities worldwide. Further research into its agronomic practices, genetic diversity, and potential health benefits could unlock even greater opportunities for its utilization and promotion in modern agriculture and nutrition.

KEYWORDS: Ragi, Ancient Grain, Millets, Nutritious, calcium.

INTRODUCTION

Millet is a traditional grain grown and consumed in the Indian subcontinent for over 5000 years. Millet is a small-grained, annual, warm-weather cereal belonging to the grass family. It is rain-fed and a hardy grain with low requirements for water and fertility compared to other popular cereals. It is highly tolerant of drought and other extreme weather conditions.

Millet is highly nutritious, non-glutinous, and non-acid-forming food. It has many nutraceutical and health-promoting properties, especially its high fiber content. Millet is high in nutrition and dietary fiber. It serves as a good source of protein, micronutrients, and phytochemicals. Millets contain 7-12% protein, 2-5% fat, 65-75% carbohydrates, and 15-20% dietary fiber.

Millets can be categorized into three types: Major Millets (Sorghum or Jowar, Pearl Millet or Bajra, Finger Millet or Ragi), Minor Millets (Foxtail Millet or Kakum, Kodo Millets or Kodon, Barnyard Millet or Sanwa, Little Millet or Kutki/Shavan, Proso Millet or Chenna/Barri),

and Pseudo Millets (Amaranth or Ramdana/Rajgira, Buckwheat or Kuttu).

Among these, Ragi scientifically known as *Eleusine coracana* also known as finger millet is an ancient grain with significant potential for addressing contemporary health challenges. Ragi is a nutritious grain widely consumed in parts of Africa and Asia. It is rich in calcium, iron, and dietary fiber, making it a valuable addition to a balanced diet, particularly for vegetarians and vegans who may struggle to obtain these nutrients from other sources. Ragi is often used to make porridge, flatbreads, and various other dishes. Its nutritional profile and versatility make it a popular choice for those seeking healthier dietary options.

Origin of Ragi (Finger millet)

It is believed to have originated in Africa, particularly in the Ethiopian highlands, where it has been cultivated for thousands of years. From its origins in Africa, ragi spread to other parts of the world, including India and Southeast Asia, where it became an integral part of traditional agriculture and cuisine.

In India, ragi cultivation dates back thousands of years, with archaeological evidence suggesting its presence in the Harappan civilization, one of the world's earliest urban civilizations. Ragi has long been a staple food in southern India, particularly in the states of Karnataka, Tamil Nadu, Andhra Pradesh, and Telangana, where it is used to make various traditional dishes.

Over time, ragi has spread to other regions of Asia and beyond, including Sri Lanka, Nepal, parts of China, and even some regions in the America where it is cultivated as a minor crop.

Scientific classification

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Monocots
Clade: Commelinids
Order: Poales
Family: Poaceae
Genus: Eleusine
Species: *E. coracana*
Binomial name: *Eleusine coracana*

Vernacular name

These names represent the diverse linguistic landscape in which ragi is known and consumed, highlighting its significance in various cultures and regions.

Hindi: Nachni, Mandua, Mandika, Marwah or Ragi

Sanskrit: Nriyakundla

English: Ragi or Finger Millet

Arabic: Tailabon

Urdu : Ragi

Kannada: Ragi

Tamil: Kezhvaragu

Telugu: Ragulu

Malayalam: Panji Pullu

Bengali: Mandua

Gujarati: Nagli

Marathi: Nachni

Rajasthani: Ragi

Punjabi: Mandua, Mandhuka

Odia: Mandia

Assamese: Madua

Nepali: Koddo

Persian: Mandwah

Plant Description of Ragi (Finger millet)

Root: Ragi has a fibrous root system that is shallow, branched, and roots at lower nodes.

Stem: The stem of Ragi is slender, erect, compressed, glabrous, and smooth, sometimes branching. It is compressed and elliptical in shape, green in color. The plant is robust, freely tillering, tufted annual grass, reaching up to 170 cm tall, and hollow at the internodes but solid at the nodes.

Leaf: Ragi plants have a dense arrangement of leaves on short, slender culms. The leaves are arranged alternately

on either side of the compressed elliptical culm and are green in color. They are distichous, simple, and entire.

Panicle: The inflorescence or panicle is borne at the end of the vegetative shoot. It is branched with one or a few branches below the main cluster of 4-19 branches. It is borne on a long peduncle. The panicle consists of a variable number of spikes ranging from 3 to 20 arranged in a bird's foot style. The branches are slender to robust, linear to oblong, up to 24 cm long, each branch with 60-80 spikelets.

Spikelets: The spikelets are carried on small rachillae at the ends of the branches of the panicle. They are often curved, crowded, and 2 to 4 flowered. There are about 70 spikelets arranged alternately on the rachis, each containing 4 to 7 seeds.

Grain: The grain of Ragi is globose and smooth with a thin, hyaline, and loose pericarp. The naked grain is more or less spherical in shape, and its color can be brown, reddish-brown, black, orange-red, purple, or white.

Chemical constituents of Ragi

Ragi is particularly notable for its high calcium, iron, and dietary fiber content. It is also rich in other essential minerals like magnesium, potassium, and phosphorus, as well as vitamins such as thiamine (B1), riboflavin (B2), niacin (B3), and folate (B9). Additionally, ragi is gluten-free and has a low glycemic index, making it suitable for individuals with celiac disease or those seeking to manage blood sugar levels. Including ragi in your diet can contribute to better bone health, improved digestion, and enhanced overall nutritional intake. It's a versatile grain that can be used in various dishes, ranging from porridge and flatbreads to baked goods and beverages.

Ragi, or finger millet, is highly nutritious and offers a range of health benefits. Here are the approximate nutritional values of 100 grams of raw ragi.

Energy: 336 kcal

Carbohydrates: 72 grams, Dietary Fiber: 3.6 grams, Sugars: 0 grams, Fat: 1.3 grams, Saturated Fat: 0.3 grams, Monounsaturated Fat: 0.4 grams, Polyunsaturated Fat: 0.6 grams, Protein: 7.3 grams, Vitamins: Vitamin A: 5 IU, Vitamin B1 (Thiamine): 0.42 mg, Vitamin B2 (Riboflavin): 0.19 mg, Vitamin B3 (Niacin): 1.1 mg, Vitamin B6: 0.3 mg, Vitamin B9 (Folate): 42 mcg, Vitamin E: 0.1 mg, Vitamin K: 0.9 mcg, Minerals: Calcium: 344 mg, Iron: 3.9 mg, Magnesium: 137 mg, Phosphorus: 283 mg, Potassium: 408 mg, Sodium: 6 mg, Zinc: 2.7 mg, Copper: 0.4 mg, Manganese: 1.6 mg, Selenium: 8.6 mcg

Use of part of ragi in medication

Seed

Uses of Ragi (Finger millet)

It is a versatile grain with a wide range of culinary uses. Here are some common ways in which ragi is used.

Porridge: Ragi porridge, often called ragi malt, is a popular breakfast dish. It's made by cooking ragi flour with water or milk and sweetening it with sugar or

jaggery. Ragi porridge is nutritious and filling, making it a healthy start to the day.

Flatbreads: Its flour is used to make various types of flatbreads, such as roti, chapati, and dosa. These flatbreads are gluten-free and have a slightly nutty flavor. They can be enjoyed with curries, chutneys, or other accompaniments.

Baked Goods: Finger millet flour can be used in baking to make cookies, cakes, muffins, and bread. It adds a unique flavor and nutritional boost to baked goods, making them healthier and more wholesome.

Snacks: Ragi is used to make a variety of snacks, including chips, crackers, and puffs. These snacks are often marketed as healthier alternatives to traditional snack foods, thanks to ragi's nutritional content.

Beverages: Ragi malt, made from ragi flour, is a popular beverage in many parts of India. It can be served hot or cold and sweetened with sugar or jaggery. Ragi malt is rich in nutrients and is believed to have various health benefits.

Baby Food: Ragi is often used in baby food recipes due to its high nutritional value. It's easy to digest and packed with essential nutrients like calcium, iron, and fiber, making it an excellent choice for growing infants.

Fermented Foods: In some cultures, ragi is fermented to make traditional foods like idli, dosa, and fermented drinks. Fermentation enhances the nutritional value of ragi and makes it more digestible.

Thickeners: Ragi flour can be used as a thickening agent in soups, stews, and sauces. It adds a nutty flavor and thick, creamy texture to dishes while boosting their nutritional content.

These are just a few examples of the many ways in which ragi can be used in cooking. Its versatility and nutritional benefits make it a popular ingredient in various cuisines around the world.

Benifites of ragi

Ragi offers a wide range of health benefits due to its rich nutritional profile. Here are some of the key benefits of including ragi in your diet.

High Nutritional Value: Finger millet is rich in calcium, iron, dietary fiber, and other essential nutrients, making it a highly nutritious food choice.

Bone Health: The high calcium content in ragi contributes to better bone health and helps prevent conditions like osteoporosis.

Iron Source: Finger millet is an excellent source of iron, which is essential for the production of red blood cells and the prevention of iron-deficiency anemia.

Dietary Fiber: Ragi contains dietary fiber, which aids digestion, promotes regular bowel movements, and helps prevent constipation.

Gluten-Free: It is naturally gluten-free, making it suitable for individuals with celiac disease or gluten sensitivities.

Low Glycemic Index: Ragi has a low glycemic index, which means it releases glucose slowly into the bloodstream, helping to regulate blood sugar levels and preventing spikes.

Weight Management: The high fiber content in ragi promotes a feeling of fullness, which can help in weight management by reducing calorie intake.

Heart Health: Ragi contains antioxidants and phytochemicals that help lower cholesterol levels, reduce the risk of heart disease, and promote overall heart health.

Improved Digestion: The dietary fiber in ragi aids in digestion and helps maintain a healthy digestive system.

Rich in Antioxidants: Ragi contains antioxidants such as polyphenols and flavonoids, which help protect cells from damage caused by free radicals and may reduce the risk of chronic diseases.

Potential Anti-Cancer Properties: Some studies suggest that the phytochemicals found in ragi may have anti-cancer properties and help prevent the development of certain types of cancer.

Versatile Culinary Uses: Ragi can be used to make a variety of dishes, including porridge, flatbreads, cookies, cakes, and beverages, providing a versatile and nutritious addition to your diet.

Dose of Ragi

The recommended serving dose of Ragi (finger millet) can vary depending on individual dietary needs and preferences. If consuming whole Ragi grains, a typical serving size might be around 50-100 gms (1/4 to 1/2 cup) of cooked finger millet per meal. Adjust the portion size according to your hunger levels and calorie requirements.

DISCUSSION

Nutritional Superiority: One key aspect to discuss is Finger millet's nutritional superiority compared to other grains. Its richness in calcium, iron, and dietary fiber sets it apart as a valuable dietary component. Its nutritional profile contributes to overall health and specific health conditions.

Cultural Significance: It holds significant cultural value in many regions where it is consumed. Discussing its cultural importance, traditional uses, and rituals associated with ragi can shed light on its deep-rooted presence in various communities.

Sustainability and Climate Resilience: Ragi's ability to thrive in diverse climatic conditions, particularly in semi-arid regions with minimal water requirements, makes it an important crop from a sustainability standpoint. How does ragi contribute to food security and resilience in regions prone to climate variability and water scarcity?

Health Implications and Dietary Recommendations: Exploring the health implications of ragi consumption is crucial. Its play important role in managing chronic diseases like diabetes, heart disease, and obesity, as well as its potential as a functional food, can provide valuable insights.

Global Adoption and Market Trends: Finger millet's increasing popularity beyond its traditional regions raises questions about its global adoption and market trends. Examining the growing demand for ragi-based products, emerging culinary trends, and market opportunities can offer perspectives on its future trajectory.

Challenges and Opportunities: Despite its numerous benefits, ragi faces challenges such as low awareness, limited processing infrastructure, and market access issues. Discussing these challenges alongside potential solutions and opportunities for innovation in ragi cultivation, processing, and marketing can facilitate its broader acceptance and utilization.

Future Research Directions: Identifying gaps in knowledge and future research directions related to ragi can guide scientific inquiry and innovation. Areas such as biofortification, agronomic practices, value addition, and health outcomes warrant further exploration to unlock the full potential of ragi as a sustainable and nutritious crop.

CONCLUSION

Finger millet is gluten-free, highly nutritious and rich in dietary fibre. They are rich in micronutrients, including calcium, iron, phosphorus, etc. It has a low Glycemic Index (GI) as such doesn't cause a huge spike in blood sugar. Millets should ideally be an integral part of our daily diet.

Dietary fibre in Finger millet has water absorbing and bulking property. It increases transit time of food in the gut which helps in reducing risk of inflammatory bowel disease and acts as a detoxifying agent in the body. So it is concluded that Ragi is the best millet for human being.

REFERENCE

1. Anonymous. Millet Statistics. Millet Statistics by ICAR (Indian Council of Agricultural Research) & IIMR (Indian Institute of Millet Research). 2021. Available from: milletstats.com [Last accessed on 19 Aug 2023].
2. World Health Organization. 2023. Available from: [https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds))
3. Mahudeswaran K, Ayyamperumal A. A note on the vitamin content of ragi. *Madras Agric J*, 1970; 57: 289-90.
4. Saleh AS, Zhang Q, Chen J, Shen Q. Millet grains: Nutritional quality, processing and potential health benefits. *Compr Rev Food Sci Food Saf*, 2013; 12: 281-95.
5. Godswill AG, Somtochukwu IV, Ikechukwu AO, Kate EC. Health benefits of micronutrients (vitamins and minerals) and their associated deficiency diseases: A systematic review. *International Journal of Food Sciences*, 2020; 3(1): 1-32.
6. Jagati P, Mahapatra I, Dash D. Finger millet (Ragi) as an essential dietary supplement with key health benefits: A review. *International Journal of Home Science*. 2021; 7(2): 94-100.
7. V. Dhanushkodi et al. *International Journal of Plant & Soil Science*. 2023; 35(18): 753-761.
8. Abah CR, Ishiwu CN, Obiegbuna JE, Oladejo AA. Nutritional composition, functional properties and food applications of millet grains. *Asian Food Sci J.*, 2020; 14(2): 9-19.