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Eleusine coracana as medicine in Ayurveda – A review

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Abstract

Eleusine coracana, popularly known as ragi is a major source of nutrition in underprivileged classes in developing countries. Though largely neglected as a food crop in elite societies, the evidences for its therapeutic significance can be dated long back. Rich in carbohydrates and essential amino acids, ragi also has significantly high amount of fiber, calcium and vitamin D. In this study, mentions of ragi in Ayurveda have been correlated with the modern research findings. Ayurveda suggests and recommends the regular use of ragi in various food preparations to gain maximum benefit largely from its phytochemicals. This review, thus aims at presenting the Ayurvedic benefits of ragi as food.

KeyTerms: Eleusine coracana, Ragi, Ayurveda, therapy, nutrition, antioxidants, fibers, doshas, vata, kapha, pitta, diabetes, anemia, obesity.

Introduction

In India, conventional medicine that uses herbs, represent the elemental component of the wellness systems. Ayurveda holds the fame to be the older most medicinal modality that brings out substantial cues in discovering plant based therapeutically active compounds. Ayurveda Materia Medica has in depth information of more than 1500 herbs and nearly 10,000 formulations (Ali *et al.* 2008; Patwardhan and Mashelkar, 2009).

Interestingly, many of the plants that are described as medicinally important are however very commonly used in the indigenous culinary system as food. This has led to the emergence of new concept of Functional foods. It implies "the foods which induce health impacts in addition to basic nutrition". Presently, nutritionists and public regard food more than mere sources of energy and nutrients. Food systems execute several biological effects through dietary mode in the human body (Siro *et al.* 2008, Devaraj *et al.* 2008; Sarkar *et al.* 2015).

Indian traditional wisdom on food processing, food preservation techniques and their therapeutic values is imprinted in the culture since ages. Traditional foods are well established as functional foods in India owing to the occurrence of components like antioxidants, probiotics, fibers and several other chemicals which promote body immunity (Sarkar *et al.* 2015).

Ayurveda suggests that apt food selection with proper dietary schedule is essential to regulate and maintain wholesome health. Foods for humans are now not only expected to quench hunger as well as provide optimum nutrition but also in the prevention of nutrition-related ailments and to promote physical as well as mental health of the people who consume. Nutritional quality of food therefore acts as a support force for health in humans. To solve the problems of deep-rooted food insecurity and malnutrition, proper nutritional levels need to be maintained (Siro *et al.* 2008; Saleh *et al.* 2013; Sarkar *et al.* 2015).

But it is true that our perception of the scientific principles of the plants used in such traditional systems is still not up to sufficient levels and this resulted in the limitation of their widespread use in patients. Exemplary research on chemical nature, pharmacognostic properties and clinical importance of ayurvedic plants is held since decades. The folk and traditional uses of plants in medicine imply the occurrence of potential elements and therefore scrutinizing plants with the prospective indigenous uses decreases the odds in the discovery of novel medicines (Zhu *et al.* 2004; Patwardhan *et al*. 2004; Arulmozhi *et al.* 2010).
Recently, cereals have also been examined for their capabilities as functional foods. Cereals occupy about 73% of the world's total cultivated area and contribute more than 60% of the world's food produce. Owing to their pharmacological activity, whole-grain cereals are much touted as prominent nutraceutical sources (Charalampopoulos *et al.* 2002; Kumar *et al.* 2016).

Eleusine coracana
Millets are a specific group of plant of Poaceae family containing smaller seed than major cereals. Millets are one of the oldest as well as primitive indigenous food grains to be used as staple food. The word "Millet" is derived from the Latin word "Milium" which equates into small seed. They are unique among food grains having smaller size but higher in nutrition. They were first ever introduced in Rigveda then in Yajurveda and Atharvaveda. Millets have been used as food as well as therapeutic diet in Ayurveda since samhitha kala. In Ayurvedic text millets have been referred by the name as Kudhanya and Trin Dhanya (Morya *et al*, 2017).
Eleusine coracana, also known by the names of finger millet or Ragi is an important millet consumed in India and African countries. United States National Academies has identified Ragi as a potential "super cereal" being one of the most nutritious among all major cereals (Kumar *et al.* 2016).

Taxonomic Classification and morphology of *Eleusine coracana*

Kingdom:	Plantae
Subkingdom:	Viridiplantae
Super division:	Embryophyta
Division:	Tracheophyta
Class:	Magnoliopsida
Super order:	Lilianae
Order:	Poales
Family:	Poaceae
Genus:	*Eleusine*
Species:	*Eleusine coracana*

(Source: Integrated Taxonomic Information System (ITIS) report April 2019).

The US National Research Council in 1996 report states that "**Despite its importance, finger millet is grossly neglected both scientifically and internationally and it is more nutritious than most cereal grains with respect to minerals, dietary fiber and amino acids**" (Siwela, 2009). Therefore, its exemplary potentials in nutritional and therapeutic attributes and as functional food need rigorous investigation (Kumar *et al.* 2016).
Ragi, is held as an important cereal grain in Ayurveda due to its numerous health benefits.

1. Nutritional and Medicinal Properties
- Ragi has a good amount of calcium, iron, proteins, and essential amino acids.

- The high fiber content supports digestion and helps in maintaining satiety, making it beneficial for weight management.
- Ragi has a low glycemic index, which aids in the management of blood sugar levels.

Nutritional Profile:
- **Calcium:** Ragi contains about 344 mg of calcium per 100 grams, which is essential for bone health and muscle function.
- **Iron:** Approximately 3.9 mg of iron per 100 grams helps in preventing anemia and improving hemoglobin levels.
- **Proteins:** It contains essential amino acids such as methionine, isoleucine, leucine, phenylalanine, and valine, crucial for tissue repair and growth.
- **Dietary Fiber:** Ragi is rich in both soluble and insoluble fiber, aiding in digestion and preventing constipation.
- **Antioxidants:** It contains phenolic compounds and flavonoids that help in combating oxidative stress (Srivastava *et al*, 2012).

2. Ayurvedic Benefits
- **Balancing Doshas:** Ragi is considered beneficial in balancing the three doshas (Vata, Pitta, and Kapha), with a particular emphasis on reducing Vata and Kapha due to its grounding and warming properties.
- **Strengthening Bones:** Due to its high calcium content, ragi is recommended for strengthening bones and preventing conditions like osteoporosis.
- **Improving Digestion:** The fiber content helps in promoting healthy digestion and preventing constipation.
- **Managing Anemia:** Its high iron content makes ragi useful in treating anemia and improving hemoglobin levels.
- **Boosting Lactation:** Ragi is often recommended to lactating mothers to boost milk production due to its high nutritional value.
- **Vata Reduction:** Ragi has warming properties, which help in calming and balancing the Vata dosha, which is associated with cold, dry, and rough qualities.
- **Kapha Reduction:** Its dry and light nature helps in reducing Kapha, which is associated with heaviness, moisture, and cold.
- **Pitta Neutral:** Ragi is generally neutral for Pitta but should be consumed in moderation during hot seasons or by those with a Pitta imbalance (Edinweera *et* al, 2009; Muthulakshmi *et al*, 2009; Singh *et al*, 2016).

3. Common Ayurvedic Preparations
- **Ragi Porridge (Ragi Ganji):** A common preparation for infants, elderly, and those recovering from illness due to its easy digestibility and high nutritional value. It is regarded as **i**deal for infants, the elderly, and those recovering from illness due to its easy digestibility and high nutritional content.
- **Ragi Malt:** A beverage made from ragi flour, which is cooling and refreshing, especially during hot weather. It is held as cool and refreshing, making it an excellent beverage for hot weather and to aid digestion.
- **Ragi Roti:** A flatbread made from ragi flour, often consumed to provide sustained energy and nutrients. It is known to provide sustained energy, essential nutrients, and aids in digestion.
- **Ragi Soup:** A nourishing and easily digestible soup made from ragi, which is beneficial for those with weak digestion or during convalescence. It is nourishing and easily digestible, suitable for patients with weak digestion (Edinweera *et* al, 2009; Muthulakshmi *et al*, 2009; Singh *et al*, 2016).

4. Therapeutic Uses in Ayurveda
- **Managing Diabetes:** Ragi is recommended for diabetics due to its low glycemic index. This property helps to slow down the digestion and absorption of carbohydrates, and thus helps in maintaining stable blood sugar levels. Ragi Reduces aggravated Pitta and Vata, which are often imbalanced in diabetic conditions.
  The high fiber content controls postprandial blood sugar spikes and improves insulin sensitivity. Diabetes (Madhumeha) is often associated with imbalances in Pitta and Vata doshas. Ragi's grounding and cooling properties help to balance these doshas. Regular consumption of ragi is recommended as it helps to manage symptoms like frequent urination, excessive thirst, and weakness. Easily digestible Ragi Porridge that stabilizes blood sugar levels; and a fiber-rich ragi roti that provides sustained energy without spiking blood sugar are the Ragi preparations that are recommended for diabetics.

- **Weight Management:** The high fiber content in ragi aids in weight loss by promoting a feeling of fullness and reducing overall calorie intake. It also helps in eliminating toxins (ama) from the body, supporting healthy weight management.
  Low caloric density offers essential nutrients without adding excessive calories. Ragi helps in detoxifying the body and improving metabolism, which is crucial for weight management. It helps in reducing Kapha dosha, which is often associated with obesity and weight gain. Ragi porridge is a food that can be added in the diet to provide nutrition without much calories.
- **Bone Health:** The calcium and vitamin D content in ragi is helpful for maintaining bone density and health. High calcium content supports bone density and prevents conditions like osteoporosis. Ragi also strengthens Asthi Dhatu (bone tissue) supporting overall skeletal health. Ragi malt is a drink that supports bone health and can be consumed daily. Ragi porridge provides the necessary nutrients for maintaining strong bones.
- **Digestion:** High fiber content of ragi aids in smooth bowel movements and prevents constipation. Fermented ragi preparations are proved to improve gut health.
  The grounding nature of ragi helps in calming Vata dosha, which is often associated with digestive issues. Ragi porridge and Ragi dose are easily digestible and soothing for the digestive system.
- **Anemia Treatment:** Regular consumption of ragi helps in increasing iron levels in the body. Ragi is rich in iron, which is essential for producing hemoglobin and preventing anemia. Ragi helps in improving and nourishing the blood tissue (Rakta Dhatu), which is crucial in managing anemia. Ragi also enhances the vitality and strength of the body, contributing to overall well-being. A nourishing ragi soup is beneficial for improving iron levels.
- **Lactation Support**: Ragi, being nutrient rich provides essential nutrients that enhance milk production. It helps in enhancing the quality and quantity of breast milk, supporting both mother and child. Ragi malt and porridge supports lactation and provides essential nutrients.
- **Managing Chronic Diseases:** High potassium content of ragi helps in regulating blood pressure levels and low sodium content is suitable for managing hypertension.
  The high fiber content lowers the cholesterol levels. The antioxidants help to combat oxidative stress and reduce the risk of heart diseases (Srivastava *et al*, 2012)**.**

Modern Research Correlation

Modern studies have supported many of the Ayurvedic claims about ragi. Research has shown the effectiveness in managing blood sugar levels, improving bone density, and providing essential nutrients that support overall health.

- **Blood Sugar Management:** Studies have shown that ragi helps in lowering blood sugar levels and improving insulin sensitivity.
- **Bone Health:** Research indicates that the high calcium and vitamin D content in ragi can help in preventing and treating osteoporosis.
- **Nutrient-Rich:** Its rich nutritional profile makes it a valuable food for overall health, supporting immune function, and providing essential vitamins and minerals (*Ali et al,* 2008; Mall *et al*, 2016; Morya *et al*, 2017)

Conclusion

Eleusine coracana (ragi) is a highly valued grain in Ayurveda, famous for its nutritional richness and capacity to balance doshas. Its regular inclusion in the diet supports overall health, manage chronic conditions like diabetes, and provide essential nutrients for various bodily functions. Through various traditional preparations, ragi is integrated into the Ayurvedic diet to harness its full therapeutic potential. Its rich nutritional profile, coupled with its ability to balance doshas, makes it a valuable addition to the diet for promoting overall health and well-being. By incorporating various ragi preparations into daily meals, one can harness its full therapeutic potential to address specific health issues and improve quality of life.

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