

The Dual Role of Finger Millets (Ragi): Combating Climate Change and Malnutrition

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Finger Millet (ragi), scientifically known as *Eleusine coracana* and locally called “madua” in India, is emerging as a vital crop in the context of climate change and global food security. Known for its adaptability to diverse climatic conditions, particularly in semi-arid and arid regions, ragi is not just a nutritional powerhouse but also a sustainable solution to some of the pressing challenges in agriculture today. Its ancient cultivation and modern-day relevance position it uniquely in the global food ecosystem as a grain of the future.

Finger Millets: A Climate-resilient Wonder Crop

Finger millets survive in environments where other crops struggle. It can grow in regions with low rainfall and poor soil fertility, requiring minimal external inputs like fertilizers or pesticides. This makes it an ideal choice for farmers in drought-prone areas. Its ability to grow on marginal lands without depleting soil nutrients further underscores its value as an environmentally friendly crop. Additionally, its genetic diversity allows it to withstand extreme weather conditions, making it a reliable crop amid climate unpredictability.

Compared to rice and wheat, ragi require significantly less water for cultivation, making it a sustainable alternative in regions facing water scarcity. Ragi’s water footprint is almost 30% lower than that of rice (Patil *et al.*, 2021). This characteristic is particularly important in arid regions where water resources are dwindling. Promoting ragi cultivation can thus contribute to water conservation efforts and reduce dependency on water-intensive crops.

Ragi’s cultivation supports carbon sequestration due to its ability to grow in degraded soils. Its hardy roots help stabilize soil, reducing erosion and enhancing carbon capture. By improving soil organic matter, ragi indirectly contributes to better soil health and reduced carbon emissions. This makes

it a crop that not only feeds populations but also helps mitigate environmental degradation (Singh & Kumar, 2020). The genetic diversity of ragi offers resilience against extreme weather events such as droughts, floods, and heat waves, making it an indispensable crop in the era of unpredictable climate patterns. Additionally, ragi’s low input requirements reduce the carbon footprint associated with its cultivation. Its promotion can play a key role in adapting to and mitigating the impacts of climate change on agriculture (Rao *et al.*, 2019).

Unexplored Health Benefits of Ragi

While ragi is well-known for its calcium and iron content, recent research has uncovered additional health benefits that make it a unique addition to modern diets:

Natural Insulin Sensitizer: Compounds in ragi have been shown to improve insulin sensitivity, making it highly beneficial for managing Type 2 diabetes. Also, ragi’s polyphenols play a crucial role in regulating blood sugar levels (Devi *et al.*, 2014). The slow-release carbohydrates in ragi also help prevent sudden spikes in blood glucose, making it ideal for diabetic patients. Regular consumption of ragi can aid in long-term blood sugar management.

Rich in Tryptophan for Mental Health: Ragi contains tryptophan, an essential amino acid that supports the production of serotonin, a neurotransmitter associated with mood regulation. Regular consumption can help combat stress, anxiety, and depression. Furthermore, ragi’s magnesium content has been linked to reduced stress levels, enhancing its role in mental health management (Sharma *et al.*, 2017). Including ragi in daily diets could provide a natural way to improve emotional well-being.

Prevention of Non-Communicable Diseases: The high antioxidant content in ragi, including phenolic acids and flavonoids, helps reduce oxidative stress,

lowering the risk of chronic diseases like cancer and cardiovascular disorders. Ragi's ability to combat inflammation also contributes to overall health, reducing the risk of metabolic syndromes (Gull *et al.*, 2016). These properties make ragi a functional food with preventative health benefits.

Enhanced Nutritional Absorption through Sprouting:

Sprouting ragi enhances the bioavailability of nutrients like iron and calcium, making it particularly effective in combating deficiencies in vulnerable populations. The process of sprouting also reduces anti-nutritional factors, further increasing its digestibility (Ravindran, 2019). This technique is a practical way to maximize the nutritional benefits of ragi in both urban and rural diets.

Ragi's Role in Addressing Food Security

Ragi's low input costs and adaptability make it a profitable crop for smallholder and marginal farmers. Promoting ragi cultivation can enhance rural livelihoods and reduce dependency on high-input cash crops. The crop's resilience also reduces the financial risks associated with crop failure due to adverse weather conditions (Aneesh, 2020).

Incorporating ragi into public distribution systems (PDS) and mid-day meal schemes can improve nutritional outcomes for underprivileged communities. The Indian government's initiatives under the "International Year of Millets 2023" have already started creating awareness about the benefits of ragi. Scaling up these efforts could significantly improve food security and nutrition (Kumar & Jain, 2018).

Ragi's nutrient density can play a crucial role in addressing malnutrition, particularly among children and women. Its use in ready-to-eat therapeutic foods (RUTF) can enhance health outcomes in malnourished populations. Leveraging ragi in nutrition programs can create long-term health improvements in vulnerable groups (Kumar & Jain, 2018).

Challenges and Solutions in Scaling Up Ragi Consumption

Despite its benefits, ragi faces several challenges that hinder its widespread adoption. Ragi is often stigmatized as a "Poor Man's Crop", i.e. food for the underprivileged. Educating consumers about its health benefits and versatility can help shift perceptions. Media campaigns highlighting ragi's

modern culinary uses can further boost its image as a premium health food (Aneesh, 2020). The lack of adequate post-harvest processing facilities reduces the shelf life and marketability of ragi. Investments in value-added processing can boost its appeal to urban consumers. Enhanced infrastructure can also create opportunities for export markets (Kumar & Jain, 2018).

Creating robust supply chains and promoting ragi-based products through branding and marketing can enhance consumer awareness and demand. Partnerships with food industries can pave the way for innovative product development and wider reach (Kumar & Jain, 2018).

Conclusion

Finger Millet (*Eleusine coracana*) is more than just a traditional grain; it is a beacon of hope for sustainable agriculture and global food security. Its ability to thrive under challenging climatic conditions, combined with its extensive health benefits and culinary versatility, makes it an invaluable asset in addressing modern challenges like climate change, malnutrition, and lifestyle diseases. By integrating ragi into daily diets and promoting its cultivation, we can pave the way for a healthier and more resilient future.

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