

Millet Roti for Northern Indian Diets: Nutritional, Sustainable and Technological Perspectives

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ABSTRACT

Millet roti is emerging as a nutritious and sustainable alternative to wheat roti in Northern India. Rich in dietary fiber, minerals, and bioactive compounds, millets offer several health benefits, including improved glycemic control, digestive health, and dietary diversity. In addition, millets are climate-resilient crops that require fewer resources, supporting sustainable food production. However, challenges related to dough handling and texture limit the widespread acceptance of millet roti. Technological interventions such as composite flour formulations, hydrocolloids, fermentation, germination, and extrusion can enhance product quality and consumer acceptability. Thus, millet roti represents a promising option for promoting healthier diets and more sustainable food systems in Northern India.

INTRODUCTION:

In Northern India, where roti is still a daily household staple, millet roti is emerging as an important food option. Wheat roti

has long been the staple food in this region, due to its simplicity in preparation and deep cultural significance. Millet roti is the perfect

way to bridge the gap between traditional eating habits and modern dietary needs. In addition to being sustainable crops, millets are nutrient-dense and functional foods that supply complex carbohydrates, dietary fiber (including prebiotics), minerals, and bioactive compounds.

However, growing concerns about nutrition, lifestyle diseases, and environmental sustainability are encouraging renewed interest in millet-based alternatives. Millet roti is the perfect way to bridge the gap between traditional eating habits and modern dietary needs. In addition to being sustainable crops, millets are nutrient-dense and functional foods that supply complex carbohydrates, dietary fiber, minerals, and bioactive compounds. By providing calcium, iron, magnesium, and other vital minerals, millet-based foods can enhance the quality of a diet as compared to cereal goods. The glycemic reaction is low, which makes it especially valuable for blood sugar control as well as a rich source of fiber that contributes to satiety and digestive health. Due to these properties, millet roti has great potential in northern Indian dietary patterns, especially where rotis are an integral part of meals (Anitha *et al.*, 2021).

Nutritional importance

The nutritional strength of millet roti lies in its ability to provide energy along with better micronutrient density. Different millets contribute different benefits: bajra is known for iron and fiber, ragi is known for calcium and other millets for improved mineral diversity and slow digestion. Because of this, millet roti can be considered a functional food that promotes improved health outcomes rather than merely a replacement for wheat roti.

For those with diabetes, anemia, or insufficient dietary diversity, millet roti offers substantial nutritional advantages. Another important

feature of millets is that they are naturally gluten-free. For those who would rather eat a variety of grains or who are gluten intolerant, millet roti is suitable. Furthermore, the higher fiber content can reduce overindulgence and encourage fullness (Fig 1). In Northern India, where roti is regularly consumed, even a slight shift to millet-based products can have a noticeable impact on food quality (Jacob *et al.*, 2024).



Fig 1: Benefits and Challenges of Shifting from Wheat to Millet Roti

Sustainable relevance

Millet roti is very important for Northern India and other agroclimatic areas from a sustainability perspective. Compared to many other cereals, millets are typically more climate-resilient. They can grow in harsher environments and require less water and chemical inputs. They are therefore appropriate for regions that experience climate variability, soil degradation, and water stress. Thus, encouraging millet production and consumption can support both environmental sustainability and food security. Dietary variety is another aspect of millet roti's sustainability value. Food systems may be more susceptible to market and climate shocks if they rely on a single staple grain. Households can promote more resilient and diversified eating habits by incorporating millet-based meals into the regular diet. This is especially important in Northern India, where wheat is dominant and alternative grains are often neglected (Khan *et al.*, 2026).

Technological perspectives

Although millet roti offers obvious nutritional and environmental benefits, technological advancements are necessary for its wider acceptance. The main problem is that millet flour lacks gluten, which makes handling dough more challenging and frequently produces rotis that are less flexible, dry, or crumbly than wheat roti. These restrictions can be addressed and consumer acceptance increased with the use of modern food processing technologies.

One important approach is composite flour technology, where millet flour is blended with wheat flour, legume flour, or other functional ingredients. This can enhance dough strength, softness, and rolling properties while retaining nutritional benefits. Another useful method is the use of hydrocolloids such as guar gum, psyllium husk, or xanthan gum, which improve water retention and reduce cracking. These ingredients help the roti remain softer for a longer period of time after preparation.

The functionality of millet flour can also be enhanced by pre-processing techniques like fermentation, germination, and extrusion. Fermentation may improve flavor and lower anti-nutritional factors, while germination can improve enzyme activity and nutrient availability. Extrusion and related processing methods can help develop ready-to-cook millet mixes that are more convenient for modern consumers. Convenience is frequently just as important as nutrition in determining whether a food is included in daily diets, which makes such innovation important (Dixit and Ravichandran 2024).

CONCLUSION

For Northern Indian diets, millet roti offers a potential blend of sustainability, nutrition, and cultural significance. It promotes climate-resilient food systems, has significant nutritional advantages, and may increase food

diversity. However, resolving practical challenges related to dough handling, texture, and shelf life is necessary for its acceptability. Modern food technologies can play a decisive role in this transformation. Composite flours, hydrocolloids, fermentation, germination and extrusion can make millet roti softer, more convenient, and more acceptable to consumers. With these developments, millet roti can emerge as a viable option for Northern India's daily diet, one that is both healthier and more sustainable.

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