Pita Bread: Optimizing Rheology and Nutritiousness of Hybrid Flour Blends

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ABSTRACT

This exclusive study assesses the possibility of enhancing the nutritional profile of traditional wheat-based pita bread while preserving its desired sensory qualities by blending in other flours. A composite flour blend has been produced and subjected through a thorough proximate testing analysis. According to the findings, the composite flour had the right amount of gluten, viscosity, water activity, solvent retention capacity, and alkaline water retention capacity for the best dough formation and pita bread quality. Additionally, compared to conventional wheat flour, the dietary fiber and protein content were dramatically increased, boosting the nutritional profile overall. An expert panel of consumers evaluated the composite pita bread using their senses, and the results showed that it was well-liked overall and in terms of look, taste, and flavor. Although the texture was to be satisfactory even if it was somewhat less than that of the wheat control. According to these results, pita bread's nutritional value can be strategically increased without sacrificing its flavor, offering a workable solution for creating healthier and more varied baked items to meet changing customer preferences. Further refining of the flour blend and processing procedures could lead to even larger improvements in the final product quality and consumer acceptance. The outcomes of this research will likely have a big impact on the bakery sector's ability to satisfy consumers' increasing demand for baked goods that are both nourishing and useful.

Keywords: Pita Bread, Composite Flour, Traditional Wheat Based Pita Bread.

INTRODUCTION

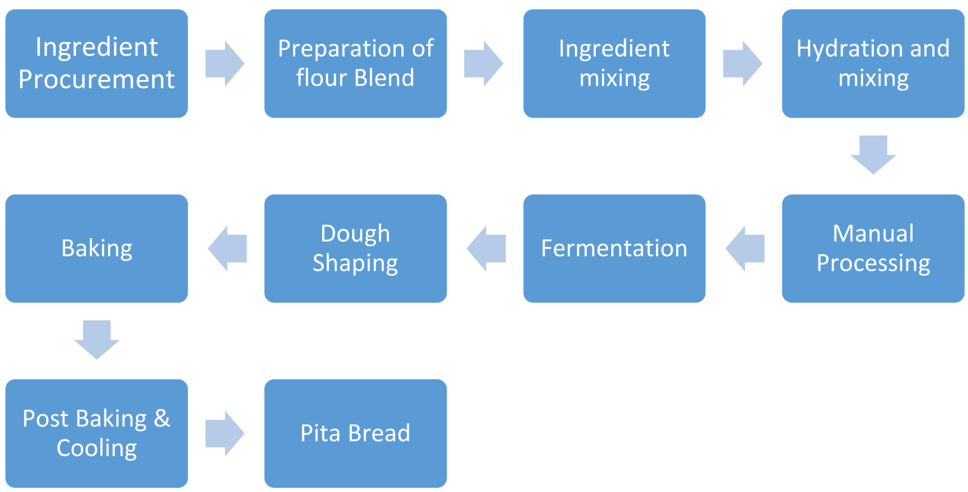
In recent years, the global food industry has experienced a substantial transition for healthier and more nutritious bread options, spurred by growing consumer awareness of the relationship between nutrition and health (Collar & Armero, 2018). This trend has prompted a rise in study into the production of functional bread products that mix varied grains, legumes, and alternative flours to boost nutritional profiles while keeping desired sensory qualities (Boukid *et al*., 2019). Because of its adaptability and general appeal, Pita bread, a mainstay of Middle Eastern and Mediterranean cuisines, has emerged as the centerpiece for these kinds of developments (Alu'datt *et al*., 2017). A popular tactic to raise the nutritional content and functional qualities of this classic flatbread is to incorporate non-wheat flours into pita bread recipes. Because of its high β-glucan and antioxidant content, barley flour has been investigated for its ability to increase dietary fiber content and reduce the glycemic index of bread products (Mudgil *et al*., 2017). Legume flours, among which are made from lentils, have garnered interest due to their high protein content, vital amino acids, and micronutrients; therefore, they present a viable option for enhancing the nutritional properties of baked products (Bresciani & Marti, 2019). Nevertheless, there are substantial challenges to technology when including non-wheat flours, especially when it comes to preserving the intended pita bread texture, volume, and sensory attributes. To obtain acceptable product characteristics, the reduction of gluten content—which is critical for dough structure and gas retention—requires careful formulation and processing changes (Mastromatteo *et al*., 2015). In order to overcome these obstacles and create composite flour pita breads with enhanced nutritional profiles and adequate consumer acceptance, recent research has concentrated on optimizing dough rheology, fermentation conditions, and baking parameters (Saha *et al*., 2022). In composite flour systems, the incorporation of active dry yeast is essential for dough growth, fermentation kinetics, and flavor production when utilized alongside precise quantities of sugar and salt (Cappelli *et al*., 2020). These components affect the sensory qualities and shelf life of the finished product in addition to aiding in the leavening process. Moreover, it has been demonstrated that the interplay between wheat and non-wheat ingredients in mixed flour systems influences water absorption, dough stability, and gas retention capacity, all of which have an effect on the final bread quality (Zannini *et al*., 2018).

The objective of this study work is to investigate a unique formulation that uses carefully chosen quantities of composite flours in order to add to the increasing body of information on the production of functional pita bread. This study aims to develop a variant of pita bread with increased nutritional value without sacrificing the traditional qualities that consumers expect. It does this by utilizing the nutritional advantages of composite flours while addressing the technological challenges associated with their inclusion. The investigation's conclusions may influence the way the baking sector develops new products in the future, meeting consumer desires for both familiar sensory pleasures and healthier options.

MATERIALS

For the purpose of making the pita dough, commercial ingredients were purchased from nearby markets. These included salt (Shan Company, Karachi) to enhance flavor, legume (Bin Hashim Supermart, Karachi) to provide plant-based protein and earthy notes, Rossmoor instant dry yeast for leavening, granulated cane sugar (Local Grocery Shop, Karachi); alternative flour and wheat (Milling Shop, Karachi) for the best gluten development.

METHODOLOGY



The pita dough preparation involved a strategic combination of wheat flour and alternative flour blends, designed to optimize structural integrity, flavor complexity, and nutritional density. A specialized leguminous flour component was strategically integrated to augment the overall nutritional profile and introduce distinctive organoleptic characteristics.

Fermentation and dough development were facilitated through carefully measured quantities of active dry yeast, sugar, and salt. The salt served dual functions of flavor enhancement and fermentation regulation. Achieving optimal dough consistency required methodical water incorporation, resulting in a smooth, elastic, and minimally adhesive mixture.

The ingredient integration process commenced by thoroughly combining various flour types with yeast, sugar, and salt in a large mixing receptacle. A characteristic well was created within the dry ingredient mixture, into which lukewarm water was incrementally introduced while continuously stirring. This technique facilitated gradual moisture absorption and uniform ingredient distribution.

Following initial mixing, the developing dough was transferred to a floured work surface, where vigorous kneading initiated gluten development. Minimal additional flour was judiciously applied to prevent excessive stickiness, ensuring optimal dough plasticity and structural potential.

Post-kneading, the dough underwent a controlled proofing process, resting in a lightly lubricated container and covered to maintain moisture. After approximately one hour, the dough volume doubled, signaling successful fermentation. The proofed dough was then gently deflated and portioned into uniform rounds, each carefully shaped to approximately 15 cm in diameter and 0.5 cm in thickness.

Cooking was executed on a preheated cast-iron surface, with each round carefully monitored to achieve slight puffing and delicate browning. Immediately following cooking, the pita loaves were draped with a soft cloth, preserving their tenderness during the cooling phase. This methodical approach yielded a distinctive pita bread variant with enhanced nutritional characteristics and exceptional sensory qualities.

RESULT & DISCUSSION

The innovative pita bread formulation exhibited remarkable nutritional and structural characteristics, signaling substantial potential for industrial production. Successful dough development was demonstrated through an impressive expansion ratio of 1.80 and substantial loaf volume of 275.50 cm^3, indicating optimal fermentation and baking processes. The nutritional composition revealed a robust profile, featuring 14.17% protein content, 10.34% dietary fiber, and 10.00% ash concentration, representing a significant departure from traditional wheat-based products.

Structural analysis revealed critical parameters supporting the bread's quality, with a 5.00% fat content and alkaline water retention capacity of 1.82 mL/g contributing to enhanced structural integrity. The solvent retention capacity of 2.50 mL/g further validated the dough's exceptional performance characteristics. Rheological assessments confirmed optimal gas retention capabilities, with a dough viscosity of 26.08 MPa indicating superior processing potential.

The final product's caloric value of 275 kcal/100g, combined with a water activity of 0.63 and gluten content of 0.46%, aligned closely with established quality benchmarks for premium pita bread. These metrics suggested a well-balanced composite flour blend that successfully integrated alternative ingredients while maintaining core bread-making principles. Although the protein content marginally deviated from traditional ranges, the results demonstrated sufficient gluten development for appropriate dough structure and expansion.

Sensory evaluation revealed promising consumer reception, with participants highlighting the unique flavor profile introduced by alternative flour components. While textural characteristics showed slight variations from conventional wheat-based controls, the overall sensory experience remained positive, suggesting successful nutritional enhancement without significant compromise to organoleptic qualities.

The comprehensive findings underscore the viability of developing nutritionally enriched pita bread through strategic flour composition modifications. The substantial increase in dietary fiber content—exceeding 150% compared to refined wheat flour—represents a particularly noteworthy nutritional advancement. Future research focusing on refined processing techniques and precise flour ratio optimization could potentially unlock further improvements in product quality and consumer acceptance.

These results present transformative implications for the bakery industry, illuminating pathways to create more diverse, nutritionally sophisticated baked products that respond to emerging consumer health preferences and dietary requirements.

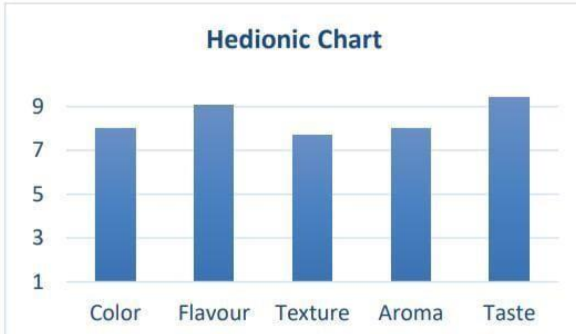


Figure 1. Sensory evaluation by panelist

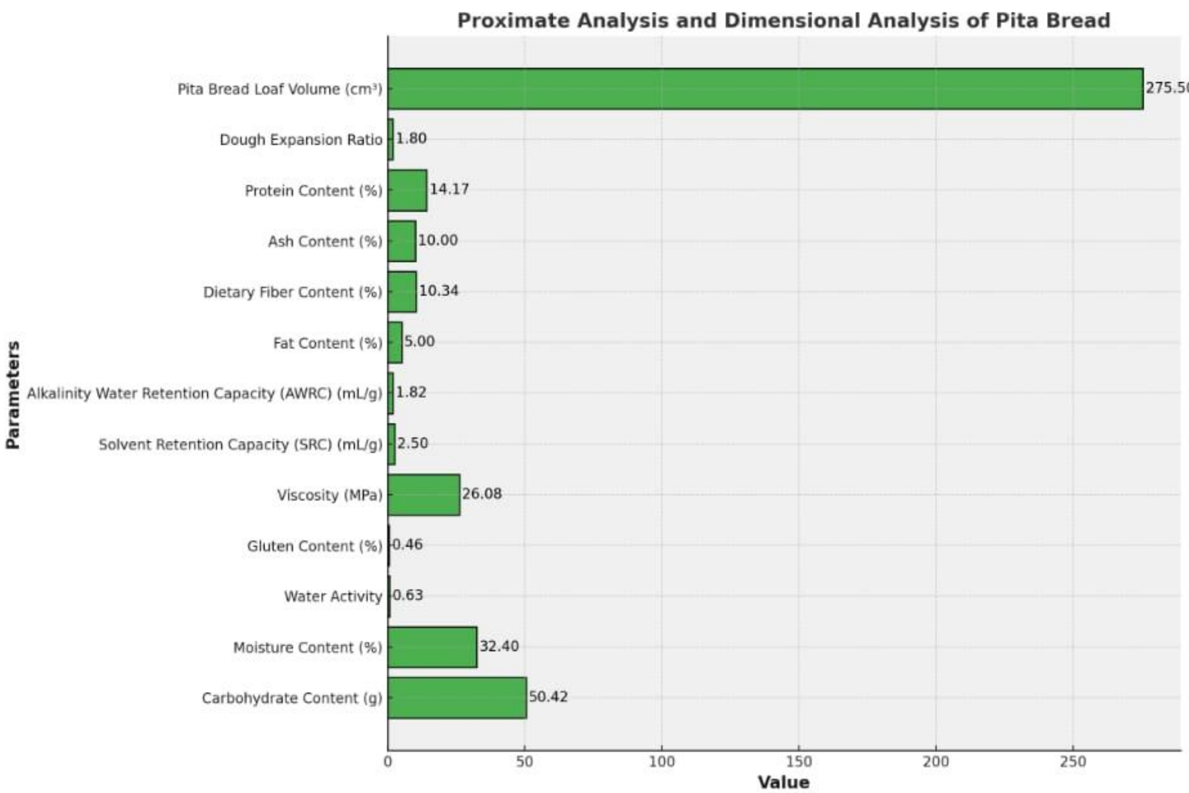


Figure 2. Proximate analysis and dimensional analysis of pita bread

CONCLUSION

The research outcomes demonstrate the feasibility of enhancing pita bread's nutritional composition through innovative composite flour integration, while preserving essential sensory characteristics. The meticulously developed flour blend exhibited exceptional physicochemical properties, including optimal viscosity, moisture absorption, and structural stability, crucial for producing high-quality pita bread with superior performance.

The alternative flour composition significantly elevated nutritional parameters, particularly in dietary fiber and protein content, substantially exceeding traditional wheat flour benchmarks. Comprehensive sensory analysis conducted by expert evaluators revealed remarkably positive consumer responses, with outstanding ratings for visual appeal, flavor profile, and overall palatability. Although the texture exhibited slight variations from conventional wheat-based products, the panel's assessment confirmed acceptable sensory qualities, validating the successful alternative flour incorporation strategy.

These groundbreaking findings present transformative opportunities for the bakery sector, directly addressing the increasing market demand for nutritionally enhanced and diverse baked products. The research illuminates potential pathways for product innovation, suggesting that strategic flour mixture modifications and advanced processing techniques could further optimize product quality and consumer satisfaction. The innovative approach demonstrated in this study offers a promising framework for developing nutritionally sophisticated pita bread variants that align with contemporary health-conscious consumer preferences, potentially revolutionizing traditional bakery product development methodologies.

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