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Research Paper

Effects of Adding Watermelon Rind Powder as a Fiber Source on the Physicochemical and Sensory Properties of Hamburger

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Extended Abstract

Introduction

The role of dietary fiber in promoting digestive health and regulating physiological functions is well-documented. Insufficient fiber intake can lead to digestive issues such as constipation, bloating, and even affect blood cholesterol and glucose levels. Although meat is a rich source of high-quality protein, it lacks significant fiber content, making it a less optimal source for balanced nutrition. To address this gap, the incorporation of fiber-rich ingredients into meat products has gained attention. This study explores the addition of watermelon rind powder, a low-cost, underutilized byproduct, as a dietary fiber source in hamburgers. The aim is to evaluate the effects of this addition on the physicochemical, textural, and sensory properties of hamburgers, potentially enhancing their nutritional profile.

Methods

Watermelon rind powder was prepared by drying and grinding the rind into a fine powder. Various levels of watermelon rind powder (3%, 6%, and 9%) were incorporated into hamburger formulations that consisted of 65% beef, with different amounts of fat and fiber sources, along with other ingredients like soy protein, salt, spices, and breadcrumbs. The control sample contained no watermelon rind powder. The samples were subjected to a range of tests, including physicochemical analysis (moisture, protein, fat, ash content, pH), texture evaluation using a texture analyzer, color analysis, and cooking properties such as shrinkage

and yield. Sensory analysis was conducted with trained panelists to assess attributes like taste, aroma, texture, and overall acceptance.

Results and Discussion

The incorporation of watermelon rind powder led to significant changes in the physicochemical properties of the hamburgers. Notably, the protein and fat contents decreased significantly in the hamburger samples containing watermelon rind powder. Ash content also decreased compared to the control, while no significant effect on moisture content was observed. The pH of the hamburgers increased significantly with the addition of watermelon rind powder, particularly in the 8% treatment. The texture of the hamburgers showed a significant increase in hardness and chewiness as the level of watermelon rind powder increased. Cooking properties revealed that the addition of watermelon rind powder resulted in a reduction of cooking shrinkage, decreased diameter, and increased thickness of the hamburgers, especially at the 12% substitution level. Cooking loss was significantly higher in the 12% treatment. Sensory evaluations indicated a decline in acceptance scores, especially for color and texture, with higher levels of watermelon rind powder. The 8% treatment was identified as the most acceptable in terms of both texture and overall sensory appeal. The incorporation of watermelon rind powder into hamburger formulations effectively introduced a dietary fiber source, resulting in several changes in the product's properties. The decrease in protein and fat content aligns with the intended goal of replacing some of the meat with fiber, thus lowering fat intake. The significant increase in hardness and chewiness suggests that the fiber from watermelon rind contributed to the textural properties, likely due to its water-holding capacity and structural integrity. The increase in pH with higher levels of watermelon rind powder might be attributed to the alkaline nature of the rind powder, which affected the pH of the meat product. Cooking properties, particularly the reduction in shrinkage and the increase in thickness, could be due to the water retention ability of fiber, which helps maintain product structure during cooking. However, higher levels of rind powder, especially at 12%, led to a higher cooking loss, indicating that excessive fiber may alter the moisture balance and cooking behavior of the product. Sensory evaluation highlighted the trade-offs between nutritional benefits and sensory appeal. While adding watermelon rind powder improved the fiber content, it also altered the color and texture, leading to reduced acceptability at higher inclusion levels. This suggests that while fiber-enhanced products have potential, optimizing the inclusion level to balance both nutritional and sensory characteristics is essential for consumer acceptance.

Conclusion

The findings of this study demonstrate that watermelon rind powder can be successfully incorporated into hamburger formulations as a source of dietary fiber. The 8% level of addition yielded the most promising results, providing a nutritionally enriched product with improved texture and increased pH, while maintaining acceptable sensory qualities. However, higher inclusion levels led to undesirable changes in the product's sensory properties, highlighting the importance of optimizing the formulation. This approach presents an opportunity to enhance the nutritional value of meat products, offering a sustainable alternative to the growing demand for fiber-enriched foods. Further research is recommended to explore the potential of other plant-based fibers on meat product formulations.

Keywords: Burger, Physicochemical properties, Fiber, Watermelon peel powder, Foodstuffs

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