



Investigating the effects of potato peel powder and whey protein concentrate on the rheological, organoleptic and texture characteristics of oily Donuts

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Extended Abstract

Introduction: In recent years, the food industry has focused on utilizing agricultural by-products to improve the nutritional value of processed foods. The incorporation of dietary fiber in bakery products is a key area of research due to its various health benefits, such as improved digestive health and reduced risk of chronic diseases. Potato peel, a significant agricultural waste, is a rich source of dietary fiber and bioactive compounds, making it a promising ingredient in the food industry. This study explores the impact of potato peel powder and whey protein concentrate on the rheological, organoleptic, and textural properties of donuts. The aim is to enhance the nutritional profile of the product while maintaining its sensory appeal.

Methods: Donuts were prepared by incorporating various levels of potato peel powder (0, 5, 10, and 15%) and whey protein concentrate (0, 3, 5, and 7%) into the dough formulation. Farinographic parameters such as dough water absorption, dough development time, dough stability, softening degree, and quality number were measured to evaluate the dough's rheological properties. Texture analysis was conducted to determine the hardness and staling of the donuts, while sensory evaluation focused on key attributes such as color, texture, taste, and overall acceptability. Statistical analysis, including one-way ANOVA and Duncan's multiple range test, was used to assess the significance of differences between treatments.

Results: The farinographic characteristics of the donut dough were significantly influenced by the levels of potato peel powder and whey protein concentrate. Increasing the percentage of these ingredients up to 10% potato peel powder and 5% whey protein concentrate resulted in a significant increase in water absorption, dough stability, and quality number ($p < 0.05$). However, higher levels of these additives (15% potato peel powder and 7% whey protein concentrate) led to

a reduction in dough development time and dough softening degree. Texture analysis revealed that hardness and staling decreased significantly with the inclusion of potato peel powder and whey protein concentrate up to 10% and 5%, respectively. However, an increase in storage time led to an increase in hardness across all samples. Sensory evaluation showed that the highest overall acceptability was achieved by the treatment containing 10% potato peel powder and 5% whey protein concentrate. This treatment also scored highest in terms of taste, texture, and color compared to other formulations.

Discussion: The increase in dough water absorption and stability with the addition of potato peel powder and whey protein concentrate is attributed to the water-holding capacity of dietary fibers and the hydrophilic nature of whey proteins. These ingredients likely contribute to a more stable dough structure, improving the product's overall texture. The reduction in dough development time and softening degree with higher levels of these additives is consistent with their effect on gluten network dilution. Furthermore, the sensory improvements observed with the inclusion of these ingredients indicate that they do not negatively impact the consumer acceptability of the product, but rather enhance its texture and taste. These findings are supported by previous research showing that the inclusion of dietary fiber in bakery products can improve textural properties while maintaining or even enhancing sensory qualities.

Conclusion: This study demonstrated that the incorporation of 10% potato peel powder and 5% whey protein concentrate into donut dough improves the dough's rheological properties, texture, staling, and sensory attributes. These ingredients not only enhance the nutritional value of the donuts by increasing their dietary fiber content but also improve product stability and overall consumer acceptability. The use of potato peel powder and whey protein concentrate provides a sustainable approach to utilizing agricultural by-products in food production, offering potential benefits in both nutritional enhancement and waste reduction in the food industry. Future studies may explore the long-term shelf stability of these products and the potential for scaling up production.

Keywords: Donuts, Potato peel powder, Whey protein concentrate, Dietary fiber, Farinographic characteristic