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Physicochemical and Sensory Characteristics of Gluten-Free Cookies Made from Buckwheat Flour and Coconut Flour

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Structured Abstract

Background: Traditional cookies, made with wheat flour containing gluten, limit options for those with dietary restrictions. Researchers and food manufacturers are exploring gluten-free flours from non-wheat sources. Buckwheat and coconut flour come from non-wheat sources and have been identified as experimental substitutes based on their unique properties and health benefits. This study aims to investigate the physicochemical and sensory properties of gluten-free cookies made with buckwheat and coconut flour.

Methods: Six formulations consisting of CW (control wheat flour), CC 100 (100% coconut flour), CB 25 (25% buckwheat flour: 75% coconut flour), CB 50 (50% buckwheat flour: 50% coconut flour), CB 75 (75% buckwheat flour: 25% coconut flour), and CB 100 (100% buckwheat flour) were assessed for moisture, protein, fat, ash, carbohydrates, calorie content, texture, colour, spread ratio, microstructural and sensory properties.

Results: CC 100 showed the highest fat ($54.95 \pm 1.34\%$), ash ($3.08 \pm 0.02\%$), and calorie value (651.51 ± 6.89 kcal/100 g), due to coconut flour's soluble fiber and fat content. CB 100 had the highest carbohydrate ($42.67 \pm 2.16\%$) and the lowest moisture ($1.71 \pm 0.12\%$) and protein contents (5.72 ± 0.05), due to the lower water-holding and protein content of buckwheat flour. Texture analysis indicated increased hardness (3.68 ± 0.31 kg) and fracturability (1.74 ± 0.18 kg) in CC 100 due to its fiber and oil-binding properties. Gluten-free cookies containing a higher ratio of buckwheat flour indicated a lower colour measurement of L^* , a^* , and b^* values. The microstructural analysis emphasizes variation in pore sizes of the cookies with different formulations. The preferred formulation based on appearance, texture, aroma, colour, and overall acceptance in the sensory evaluation were CB 25 and CB 50.

Conclusion: This study highlights the specialties of these flours for cookie quality, texture, and nutritional composition. Coconut flour enhances moisture retention, dough density, protein, and ash contents. Buckwheat flour provides complex carbohydrates and antioxidants, resulting in drier cookies with a firmer texture. Different ratios of coconut and buckwheat flours offer balanced formulations that meet nutritional and sensory requirements.

Keywords: Buckwheat Flour, Celiac Disease, Coconut Flour, Gluten-Free

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