

Nutritional, Functional Properties and Microbial Safety of Wheat Flour Biscuits Incorporated with Malted Pearl Millet Flour and Orange Peel Powder

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Abstract

Biscuits are widely consumed because of their availability, easy to eat, convenience they are normally made from wheat (*Triticum aestivum*) flour. Pearl millet (*Pennisetum glaucum*) is a high energy cereal known for its rich nutritive value. Orange peels are considered as waste by-products and are often unused. The aim of the study was to examine the nutritional, functional properties, microbial safety of wheat flour biscuits incorporated with malted pearl millet flour (MPMF) and orange peel flour. Composite biscuits were developed by replacing wheat flour (100%, 90%, 80%, 70%, 60%) with malted pearl millet flour (8, 16, 24, 32%) and orange peel flour (OPF) (2, 4, 6, 8%), prepared biscuits with 100% wheat flour were used as control. Results were analysed using SPSS version 26. Proximate composition, physical properties, functional properties and microbial quality of flour and biscuit samples were also evaluated. Thermal properties were conducted on flour samples. Incorporating wheat flour with MPMF –OPF blends resulted in highly nutritious biscuits. Significant ($p < 0.05$) increase was found in crude protein (11.70-13.41%), crude fibre (11.44-16.24%), ash (4.50-5.54%) and moisture content (4.50 to 5.54%). However fat content, carbohydrates and total energy decreased. The thickness of biscuits was increased, whereas diameter spread factor and spread ratio of biscuits decreased with increasing levels of MPMF-OPF blends. The biscuits substituted with MPM-OPF blends had higher values of bulk density, swelling power, water holding capacity, oil absorption capacity while forming capacity and dispersibility decreased. TPC (14022.75-35662.81mgGAE/g), TFC (2.91-5.22mgRE/g, Vitamin C (0.79-1.01) were increased significantly ($P < 0.05$) by increasing MPMF-OPF blends, FRAP decreased significantly ($p < 0.05$) with increased level of MPMF-OPF blends. Addition of malted MPMF-OPF blends improves thermal properties of flour. Colour attributes L, a*, b* decrease significantly ($p < 0.05$) with the adding of MPMF-orange peel flour blends, these findings indicate darker colour of biscuits. Microbial isolation decreased with the addition of blends. Therefore, MPMF –OPF blends supplemented biscuits could be recommended to be produced as biscuits with good quality attributes and highly nutritious.