Abstract

Excessive oil absorption is a major concern in fried foods, including doughnuts, as it negatively affects nutritional quality and consumer acceptability. Hydrocolloids are polysaccharides that have been widely used as fat-reduction agents due to their ability to modify moisture retention and mass transfer. However, the effectiveness of soluble and insoluble cellulose-based hydrocolloid combinations to reduce oil absorption has not been extensively studied. This study evaluated the effects of a microcrystalline cellulose (MCC) and sodium carboxymethyl cellulose (CMC) blend on the physicochemical, physical, and sensory properties of the fried doughnuts. Three formulations were prepared containing 0%, 0.25%, and 0.5% hydrocolloid blend. The product quality was assessed through physicochemical analyses, which included chemical assessments (crude fat and moisture content) and physical analyses (frying loss, TPA, and colorimetry), along with sensory evaluation for acceptability tests (9-point hedonic liking and ranking test), which involved 50 semi-trained panelists. The results revealed that there was a significant reduction ($p < 0.05$) in total oil content from 21.826% in T0 to 16.715% in T1 and 14.376% in T2. Reduced oil absorption was accompanied by increased moisture retention ($p > 0.05$) and lower frying loss, indicating modified moisture–oil exchange during frying. Hydrocolloid-treated doughnuts also exhibited lower hardness values ($p < 0.05$) and higher lightness (L*) ($p < 0.05$) than the control. Although hedonic scores were not significantly different, the ranking test revealed T1 as the most preferred sample ($p < 0.05$), while T2, despite decreasing oil content, was less acceptable due to its chewy texture. Overall, the MCC–CMC blend improved doughnut quality, with the 0.25% formulation providing the best balance between oil reduction, product quality, and consumer acceptability.

Keywords: Fried doughnuts, hydrocolloids, Microcrystalline Cellulose (MCC), oil absorption, Sodium Carboxymethyl Cellulose (CMC)