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Formation of milk protein-based coconut and sesame oil edible oleogels as spreadable products: A proof-of-concept study

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Abstract

Edible oils are conventionally converted to spreadable form via hydrogenation. However, hydrogenation leads to the formation of trans-fatty acids that cause metabolic syndrome and cardiovascular diseases. Oleogelation is an emerging technology that converts liquid oils into spreadable form without hydrogenation. The present study investigates the possibility of converting coconut oil and sesame oil into spreadable fat products using milk protein-assisted emulsion template oleogelation. In this study, oil in water emulsions with a range of milk protein concentrations (2% (w/w), 3% (w/w) and 6% (w/w) in the aqueous phase) were prepared using sesame oil, coconut oil and reconstituted milk powder solutions. The emulsions were gelled using acidification and dewatered by pressing at 2.6 kNm⁻² pressure to obtain oleogels. Stability measurements in room temperature (around 29°C) and optical microscopic images revealed that the stability of oleogels improved with the increase in protein content, due to the formation of a compact gel network. In coconut oil oleogel samples, the oil separation index was significantly decreased ($p < 0.05$) from 12.4 to 8.4 as milk protein concentration increased from 2% (w/w) to 6% (w/w). The oil separation indices of sesame oil oleogels made with 2%, 3% and 6% milk protein concentrations were 4.5, 5.7 and 2.4, respectively. Increase in protein content from 2% (w/w) to 6% (w/w) led to a significant increase ($p < 0.05$) in the moisture content of oleogels. Coconut oil oleogels made with 2% (w/w), 3% (w/w) and 6% (w/w) milk protein concentrations had 20.6% (w/w), 25.7% (w/w) and 33.0% (w/w) moisture, respectively. Similarly, sesame oil oleogels made with 2%, 3% and 6% milk protein concentrations had 21.0% (w/w), 24.5% (w/w) and 29.4% (w/w) moisture, respectively. Visual observations of sesame oil oleogels showed better stability and spreadability than coconut oil oleogels, in all protein concentrations studied. This study demonstrates the possibility of applying milk protein acid gelation to form spreadable oleogels using coconut and sesame oil.

Keywords: Acid gelation, Coconut oil, Emulsion template, Oleogelation, Sesame oil

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