

Fabrication of concentrated palm olein-based diacylglycerol oil–soybean oil blend oil-in-water emulsion: in-depth study of the rheological properties and storage stability

ABSTRACT

The present study focused on investigating the storage stability of oil-in-water (O/W) emulsions with high oil volume fractions prepared with palm olein-based diacylglycerol oil (POL-DAG)/soybean oil (SBO) blends at 25 °C. The incorporation of different ratios of oil blends significantly influenced ($p < 0.05$) the texture, color, droplet size distribution, and rheological parameters of the emulsions. Only emulsions incorporated with 10% to 20% POL-DAG in oil phase exhibited pseudoplastic behavior that fitted the Power Law model well. Furthermore, the O/W emulsions prepared with POL-DAG/SBO blends exhibited elastic properties, with G' higher than G'' . During storage, the emulsion was found to be less solid-like with the increase in $\tan \delta$ values. All emulsions produced with POL-DAG/SBO blends also showed thixotropic behavior. Optical microscopy revealed that the POL-DAG incorporation above 40% caused aggregated droplets to coalesce and flocculate and, thus, larger droplet sizes were observed. The current results demonstrated that the 20% POL-DAG substituted emulsion was more stable than the control emulsion. The valuable insights gained from this study would be able to generate a lot more possible applications using POL-DAG, which could further sustain the competitiveness of the palm oil industry.

Keyword: Diacylglycerol; Soybean oil; Emulsion; Rheology; Microstructure; Emulsion stability