

Characterization of structural stability of palm oil esters-based nanocosmeceuticals loaded with tocotrienol

ABSTRACT

Background: Palm oil esters (POEs) are esters derived from palm oil and oleyl alcohol have great potential in the cosmetic and pharmaceutical industries due to the excellent wetting behavior of the esters without the oily feel. The role of oil-in-water nanoemulsions loaded with tocotrienol sedimentation behavior was studied. LUMiFuge® 116 particle separation analyzer was used to investigate the sedimentation behavior of POEs/tocotrienol/xanthan gum nanoemulsion system during centrifugation. Analyzing the sedimentation kinetics of dispersions in a centrifugal field also yields information about the rheological behavior and structural stability. **Methods:** Experiments were performed in an analytical centrifuge at 11×g to 1140×g (LUMiFuge® 116 particle separation analyzer). The samples in the LUMiFuge® 116 particle separation analyzer were centrifuged at 3000 rpm for 15 h at 32°C. Sample volume of 2 cm³ was used. The rheological property of nanoemulsions was investigated using oscillatory measurements test. A rotational/oscillatory viscometer, Kinexus Rheometer (Malvern Instrument, UK) was used. All measurements were performed with a stainless steel cone-plate sensor at 25.0 ± 0.1°C with 4°/40 mm. **Results:** The stable nanoemulsions showed sedimentation rates at earth gravity of 5.2, 3.0 and 2.6 mm/month for 10%, 20% and 30% (w/w) oil phase, respectively. Rheological behavior is an important target during the design of palm oil esters-based nanocosmeceuticals. The presence of a network structure was indicated by measurements which showed G' to be greater than G'' This result implied the predominant elastic response and high storage stability of the nanoemulsion. It was also observed that the increase in oil phase concentration led to the profile which strongly indicated that the solid like elastic property; where the values of phase angle, δ of these nanoemulsions was lower than 45°. **Conclusions:** The nanoemulsions with higher oil phase concentration (30% (w/w)) showed greater elasticity which implied strong dynamic rigidity of the nanoemulsion. It was the most stable with longest shelf-life.

Keyword: Nanoemulsion; Palm oil esters; Rheological; Sedimentation; Tocotrienol