Physical properties and stability of oil-in-water nanoemulsion containing shallot extract prepared by low-energy vs high-energy methods
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Abstract: Shallot (Allium hirtifolium) has a wide range of pharmacological effects including antimicrobials, antioxidant, and respiratory systems. However, encapsulation of active ingredients is required to improve stability, delivery and release control, as well as reducing unwanted smell and color. In this study, encapsulation of shallot extract using oil-in-water (O/W) nanoemulsion has been studied. The impact of the preparation methods—high speed homogenizer (low-energy method) vs. probe sonicator (high-energy methods)—on physical properties and stability of the shallot nanoemulsion has been focused. The nanoemulsion was formulated using natural oil and a mixture of cosurfactants. With the optimized composition, it was found that using high energy method could produce nanoemulsion of shallot with a great stability over 4 months under storage conditions at 4°C, 45°C, and heating cooling between 4°C and 45°C. Particle sizes of less than 200 nm with a narrow size distribution (PDI < 0.3) could be achieved. On the other side, all formula prepared by using the low-energy method resulted in phase separation within a week after storage. Their particle sizes were greater than 500 nm with a wider size distribution (PDI > 0.5). Moreover, zeta potential, surface tension, and contact angle of the nanoemulsion have also been determined.

Keywords: Shallot; Encapsulation; Nanoemulsion; Preparation method; Stability