

## INTISARI

Emulsi *Pickering* merupakan emulsi bebas surfaktan yang memiliki stabilitas tinggi. Emulsi *Pickering* berpotensi diaplikasikan pada enkapsulasi bahan aktif. Stabilitas emulsi *Pickering* dapat dipertahankan melalui mekanisme sterik (perlindungan terhadap agregasi droplet secara mekanis) yang terjadi pada antarmuka fase minyak/air. Salah satu produk yang dapat memberikan efek sterik pada emulsi *Pickering* adalah nanopartikel pati. Nanopartikel pati berbasis buah sukun belum banyak dieksplorasi pada penstabilan emulsi *Pickering* yang diaplikasikan sebagai enkapsulasi bahan aktif. Maka dari itu, penelitian ini bertujuan untuk mendapatkan nanopartikel pati sukun yang mampu menstabilkan emulsi *Pickering* dan diaplikasikan pada enkapsulasi minyak atsiri kayu manis. Tahap pertama penelitian menerapkan metode nanopresipitasi dalam preparasi nanopartikel pati sukun, yang dilanjutkan dengan evaluasi kemampuan nanopartikel pati sukun dalam mempertahankan stabilitas emulsi *Pickering*. Kemudian, tahap kedua penelitian menggunakan nanopartikel pati sukun ukuran terkecil dengan kemampuan penstabilan terbaik dalam proses optimasi formula enkapsulasi minyak atsiri kayu manis berbasis emulsi *Pickering*. Selanjutnya, tahap ketiga penelitian mengamati proses pelepasan minyak atsiri pada formula enkapsulasi yang optimal (efisiensi enkapsulasi tertinggi). Hasil penelitian menunjukkan bahwa campuran 5 (%(b/v)) pati sukun dan 0,1875 M NaOH dapat membentuk nanopartikel pati sukun yang mampu mempertahankan stabilitas emulsi *Pickering* selama 2 minggu; dengan ukuran droplet  $\sim 30 \mu\text{m}$  dan *creaming index* 0%. Selanjutnya, nanopartikel pati sukun tersebut diformulasikan pada enkapsulasi minyak atsiri kayu manis berbasis emulsi *Pickering* dan diperoleh formula optimal berupa 2,96 (%(b/b)) nanopartikel pati sukun, 20,66 (%(b/b)) fase minyak, 0,8 (%(b/b)) minyak atsiri kayu manis. Formula tersebut mampu menghasilkan efisiensi enkapsulasi tinggi; yaitu 95% dan mempertahankan stabilitas minyak atsiri selama penyimpanan serta mengendalikan pelepasan minyak atsiri kayu manis pada media; dengan difusivitas sebesar  $1,56\text{--}2,47 \times 10^{-10} \text{ m}^2/\text{s}$  melalui mekanisme relaksasi struktur emulsi *Pickering* dan difusi. Oleh karena itu, nanopartikel pati sukun terbukti mampu menjadi penstabil emulsi *Pickering* yang diaplikasikan sebagai sistem pembawa minyak atsiri kayu manis.

## ABSTRACT

Pickering emulsion is surfactant-free emulsion that has high stability. Pickering emulsion has potency to be applied in the encapsulation of active ingredients. The stability of Pickering emulsion can be maintained through steric effect (protective effect against droplet aggregation in mechanical way) at the oil/water phase interface. One of products that can provide the steric effect in Pickering emulsion is starch nanoparticle. Breadfruit-based starch nanoparticles have not been widely explored in Pickering emulsion stabilization applied as encapsulation of active ingredients. Therefore, this study aimed to obtain the breadfruit starch nanoparticle that can stabilize a Pickering emulsion and be applied in encapsulation of cinnamon essential oil. In this study, the first stage performed nanoprecipitation method in preparation of breadfruit starch nanoparticles, followed by evaluation of their ability to stabilize Pickering emulsions. Then, the second stage used the smallest size of breadfruit starch nanoparticles with the best capacity of Pickering emulsion stabilization in the optimization process of the formula of cinnamon essential oil encapsulation inside Pickering emulsion. Finally, the third stage observed the release process of essential oils in the optimized formula (the highest encapsulation efficiency). The results showed that a mixture of 5 (%(w/v)) breadfruit starch and 0.1875 M NaOH could form breadfruit starch nanoparticles that were able to preserve the Pickering emulsion stability for 2 weeks; with droplet size of  $\sim 30 \mu\text{m}$  dan *creaming index* of 0%. Furthermore, the breadfruit starch nanoparticles were formulated in the delivery system formation of cinnamon essential oil in Pickering emulsion and the optimal formula was 2.96 (%(w/w)) breadfruit starch nanoparticles, 20.66 (%(w/w)) oil phase, 0.8 (%(w/w)) cinnamon essential oil. This formula could encapsulate with high efficiency; which was 95% and maintain the stability of cinnamon essential oil during storage, as well as control the release of cinnamon essential oil on the media; with a diffusivity of  $1.56\text{-}2.47 \times 10^{-10} \text{ m}^2/\text{s}$  through mechanism of Pickering emulsion structure relaxation and diffusion. Therefore, breadfruit starch nanoparticles proved capable of stabilizing a Pickering emulsion which was applied as a delivery system of cinnamon essential oil.