INTISARI

Penelitian ini bertujuan untuk mengetahui stabilitas dan sifat fungsional nanokapsul karotenoid dari *Spirulina platensis* dengan enkapsulan gum arab dan konsentrat protein *whey* pada berbagai pH dan suhu. Tahapan penelitian ini meliputi ekstraksi karotenoid *S. platensis*, pembuatan fraksi air dan minyak, pembuatan emulsi, proses *spray drying*, dan melarutkan nanokapsul *S. platensis* dengan variasi pH dan suhu. Penelitian ini menggunakan Rancangan Acak Lengkap (3 kali ulangan) dengan dua faktor yaitu pH (3,4,5,6,7,8) dan suhu (tanpa pemanasan, suhu 70,85,100°C). Data dianalisis menggunakan analisis varians (ANOVA) dengan tingkat kepercayaan 95% dan uji lanjut *simple effect* polinomial orthogonal. Parameter yang diamati meliputi karotenoid total, karotenoid permukaan, retensi karotenoid, efisiensi enkapsulasi, warna, ukuran partikel, dan sifat fungsional meliputi: kelarutan, *water holding capacity* (WHC), *foaming capacity* (FC), dan *emulsifying capacity* (EC). Analisis warna dan ukuran partikel dilakukan terhadap sampel dengan stabilitas karotenoid terbaik. Hasil penelitian menunjukkan terdapat signifikansi pada interaksi pH dan suhu terhadap parameter karotenoid total, karotenoid permukaan, retensi karotenoid, WHC, dan *emulsifying capacity* ($p<0,05$), namun tidak terdapat signifikansi pada parameter efisiensi enkapsulasi, kelarutan, dan *foaming capacity* ($p>0,05$). Kelarutan bubuk dan *foaming capacity* hanya dipengaruhi suhu, sedangkan efisiensi enkapsulasi dipengaruhi masing-masing faktor pH dan suhu. Stabilitas karotenoid nanokapsul cenderung fluktuatif pada suhu 70°C dan 85°C (titik minimal pada ~pH 4 dan ~pH 6, titik maksimal pada ~pH 5 dan ~pH 8), pada suhu 100°C maksimal pada ~pH 4 dan minimal pada ~pH 7. Stabilitas karotenoid menurun seiring peningkatan suhu, terbaik pada suhu 70°C pH 5. EC berbanding lurus dengan stabilitas karotenoid, sedangkan WHC berbanding terbalik. Pengaruh suhu menurunkan FC dan kelarutan nanokapsul seiring peningkatan suhu.

Kata kunci : karotenoid, *Spirulina platensis*, nanokapsul, sifat fungsional, pH, suhu

ABSTRACT

This study aims to determine the stability and functional properties of carotenoid *Spirulina platensis* encapsulated with arabic gum and whey protein concentrate in various pH and temperature. The steps of this research included extraction of *S. platensis* carotenoids, the preparation of water and oil fraction, emulsification, spray drying process, and dissolving *S. platensis* nanocapsules in variations pH and temperature. This study used a completely randomized design (3 replications) with two factors, namely pH (3,4,5,6,7,8) and temperature (without heating, temperature of 70,85,100°C). Data were analyzed using analysis of variance (ANOVA) with a confidence level of 95% and a simple effect orthogonal polynomials. The parameters observed were total carotenoids, surface carotenoids, carotenoid retention, encapsulation efficiency, color, particle size, and functional properties consists of solubility, water holding capacity (WHC), foaming capacity (FC), and emulsifying capacity (EC). Color and particle size analysis were performed on the sample with best carotenoid stability. The results showed that there were significant interactions between pH and temperature on total carotenoid parameters, surface carotenoids, carotenoid retention, WHC, and emulsifying capacity ($p < 0,05$), but not significant ($p > 0,05$) in encapsulation efficiency, solubility and foaming capacity. Solubility and foaming capacity were only influenced by temperature, encapsulation efficiency influenced by each factor pH and temperature. The stability of carotenoids tended to fluctuate at temperatures of 70°C and 85°C (minimum points at ~ pH 4 and ~ pH 6, maximal points at ~ pH 5 and ~ pH 8), at a temperature of 100°C at a maximum of ~ pH 4 and minimal at ~ pH 7. The stability of carotenoids decreased with increasing temperature, with the best result was treatment at 70°C pH 5. EC was directly proportional to the stability of carotenoids, while the WHC was inversely proportional. Increasing of temperature decreased FC and solubility too.

Keywords: carotenoids, *Spirulina platensis*, nanocapsules, functional properties, pH, temperature