INTISARI

Fikosianin sebagai biopigmen dari *Spirulina* dapat menghasilkan warna biru cerah sehingga digunakan untuk pewarna alami. Secara umum proses produksi pewarna alami fikosianin dibagi dalam beberapa tahapan yaitu ekstraksi, purifikasi, dan dehidrasi. Penelitian ini dilakukan untuk mengoptimalkan proses ekstraksi berbantu ultrasonikasi dari biopigmen fikosianin *Spirulina* agar diperoleh intensitas warna, konsentrasi, *yield*, dan rasio kemurnian tertinggi sehingga setelah dipurifikasi dapat memenuhi standar *food grade*. Selanjutnya ekstrak fikosianin dienkapsulasi menggunakan agen pembawa dengan berbagai konsentrasi kemudian dipilih berdasarkan karakteristik fungsionalnya.

Ekstraksi berbantu ultrasonikasi dilakukan menggunakan pelarut buffer sodium fosfat 0,1 M pH 6,8 pada variasi lama waktu kontak yaitu 2,5-10 menit dengan amplitudo 20-50% dan perlakuan jeda-kontinyu dengan rasio biomassa:solven 1:10-1:25. Setelah dilakukan perlakuan perendaman dan sentrifugasi, kemudian ekstrak dipurifikasi dengan arang aktif konsentrasi 10-100 g/L. Ekstrak dienkapsulasi dengan metode pengeringan semprot menggunakan agen pembawa maltodekstrin 2,5-10% dan isolat protein kedelai (SPI) 1,25-5%. Percobaan dilakukan menggunakan rancangan acak lengkap satu dan dua faktor kemudian dianalisis statistik menggunakan Duncan's multiple range test (DMRT).

Hasil penelitian menunjukkan ekstraksi dengan amplitudo 50% 10 detik on/off selama 2,5 menit kemudian direndam selama 1 jam serta sentrifugasi 12000 rpm 15 menit memberikan rasio kemurnian mencapai 0.42. Konsentrasi arang aktif 30 g/L meningkatkan rasio kemurnian secara signifikan. Bubuk fikosianin menunjukkan agen pembawa maltodekstrin 10% menghasilkan solubilitas (91.03%), kadar air (10,06%), dan higroskopisitas (12.24%) lebih baik. Sementara SPI 1,25% memberikan ΔE* (13.19) dan *hue angle* (294.49) mendekati komersial, sedangkan kadar fikosianin (11.47%) dan efisiensi enkapsulasinya (99,75%) lebih tinggi serta distribusi partikel yang lebih seragam. Agen pembawa maltodekstrin lebih baik dalam hal penyimpanan, tetapi isolate protein kedelai dipilih karena karakteristik fungsional warnanya.

Kata kunci: Ultrasonikasi; Biopigmen; Fikosianin; Spirulina; Pengeringan Semprot

ABSTRACT

Phycocyanin is a natural dye providing a bright blue color from Spirulina (*Arthrospira platensis*). Generally, the production process of phycocyanin biopigment is divided into stages: extraction, purification, and dehydration. This research was conducted to optimize the ultrasonication-assisted extraction process from Spirulina phycocyanin biopigment in order to obtain the highest color intensity, concentration, yield, and purity ratio that meets food-grade standards after being purified. Activated charcoal was used for the purification process because it effectively increases the purity of phycocyanin. Encapsulation of phycocyanin extracts was carried out using carrier agents with various concentrations then selected based on their functional characteristics.

Ultrasound-assisted extraction was performed using phosphate buffer 0.1 M at pH 6.8 in the treatment of variations in contact time of 2.5–10 minutes with an amplitude of 20–50% and pulsed treatment with biomass:solvent ratio of 1:10–1:25. After soaking and centrifugation, the extract was purified with activated charcoal at a concentration of 10–100 g/L. The purified extract with the highest purity ratio was spray-dried using 2.5–10% maltodextrin and 1.25–5% soy protein isolate (SPI) carrier agent to form the powder. Subsequently, the powder was characterized for yield, %phycocyanin, color (ΔE*, hue angle, chroma), solubility, hygroscopicity, encapsulation efficiency, morphology, and particle size. The experiment was conducted using a completely randomized design of one and two factors and then statistically analyzed using Duncan's multiple range test (DMRT).

The results showed that extraction with an amplitude of 50% 10 seconds on/off for 2.5 minutes, then soak for 1 hour, and centrifugation at 12000 rpm for 15 minutes gave a purity ratio of 0.42. The activated charcoal concentration of 30 g/L increased the purity ratio significantly. The results of the dissolved phycocyanin powder showed that 10% maltodextrin carrier produced better solubility (91.03%), water content (10.06%), and hygroscopicity (12.24%). Meanwhile, SPI 1.25% gave ΔE* (13.19) and hue angle (294.49) close to commercial, while phycocyanin content (11.47%) and encapsulation efficiency (99.75%) were higher than maltodextrin with more uniform particle distribution. Maltodextrin carrier agent is better in terms of storage, but soy protein isolate was chosen because of its color functional characteristics.

Keywords: Ultrasonication; Biopigment; Phycocyanin; Spirulina; Spray Drying