

OPTIMASI KONSENTRASI KOMBINASI BAHAN DINDING GUM ARAB, MALTODEKSTRIN DAN *WHEY PROTEIN ISOLATE* PADA MIKROKAPSUL FIKOSIANIN DARI *Arthrospira platensis*

INTISARI

Fikosianin merupakan salah satu jenis fikobiliprotein pada *Arthrospira platensis* yang memiliki pigmen berwarna biru dan mengandung sumber antioksidan. Fikosianin cenderung sensitif terhadap faktor dari pH, suhu dan cahaya. Proses mikroenkapsulasi dengan *spray drying* dapat meningkatkan stabilitas fikosianin dari faktor-faktor fisik maupun kimia. Penelitian terdiri dari 2 tahapan yaitu penelitian tahap I bertujuan untuk optimasi konsentrasi bahan dinding gum arab (10-15)% (b/v), maltodekstrin (5-10)% (b/v) dan whey protein isolate (4-5)% (b/v) menggunakan respon surface method (RSM) dengan desain eksperimen *Central Composite*, dilanjutkan verifikasi nilai optimum. Penelitian tahap II bertujuan untuk mengukur stabilitas mikrokapsul fikosianin optimum terhadap suhu, intensitas cahaya dan pH. Model konsentrasi bahan dinding mikrokapsul fikosianin akan dioptimasi berdasarkan respon parameter fisikokimia mikrokapsul. Uji kesesuaian model menggunakan ANOVA yang dianalisis menggunakan software minitab versi 19.1.1. Hasil optimasi secara simultan parameter yang diamati diperoleh konsentrasi gum arab 8,3% (b/v), maltodekstrin 11,7% (b/v) dan whey protein isolate 5,2 % (b/v) dengan nilai desirability simultan sebesar 0,7656. Hal ini mengindikasikan bahwa formulasi optimum akan menghasilkan mikrokapsul fikosianin dengan karakteristik yang sesuai dengan target yang diinginkan (desirability) 76,56 %. Hasil verifikasi respon simultan parameter yield 81,45%; kadar fikosianin 3,60%; aktivitas antioksidan 52,36%; efisiensi enkapsulasi 94,48%; retensi fikosianin 61,88%; kelarutan 93,38% dan ukuran partikel 205,3 nm. Kisaran standar deviasi antara nilai prediksi dan nilai aktual sebesar 0,6718 – 5,2538. Selanjutnya, formulasi optimum diuji stabilitas terhadap suhu (45 °C, 60 °C, 75 °C), intensitas cahaya (1000 lux, 2500 lux dan 4000 lux) dan pH (4,5,6,7 dan 8) dengan parameter degradasi fikosianin, degradasi aktivitas antioksidan dan *Total Color Difference* (TCD) serta kadar fikosianin. Hasil stabilitas mikrokapsul fikosianin menunjukkan Perlakuan suhu dan intensitas cahaya pada perlakuan terang berpengaruh nyata terhadap degradasi fikosianin, aktivitas antioksidan dan *total color difference*, namun perlakuan intensitas cahaya pada penyimpanan gelap tidak memberikan pengaruh nyata. Selain itu, mikrokapsul fikosianin memiliki stabilitas terbaik pada kondisi pH 6.

Kata Kunci : Mikrokapsul, RSM, Stabilitas, Optimasi, *Desirability*

OPTIMIZATION OF CONCENTRATION COMBINATION OF GUM ARABIC, MALTODEXTRIN AND WHEY PROTEIN ISOLATE IN MICROCAPSULES OF PHYCOCYANIN FROM *Arthrospira platenis*

ABSTRACT

Phycocyanin is a type of phycobiliprotein in *Arthrospira platensis* which has a blue pigment and contains a source of antioxidants. Phycocyanin tends to be sensitive to factors such as pH, temperature and light. Microencapsulation process with *spray drying* can increase the stability of phycocyanin from physical and chemical factors. The research consisted of 2 stages, namely phase I research aimed at optimizing the concentration of gum arabic wall material (10-15)% (w/v), maltodextrin (5-10)% (w/v) and whey protein isolate (4-5)% (w/v) using the response surface method (RSM) with experimental design *Central Composite*, followed by verification of the optimum value. Phase II research aims to measure the stability of optimum phycocyanin microcapsules against temperature, light intensity and pH. The phycocyanin microcapsule wall material concentration model will be optimized based on the response of the microcapsule physicochemical parameters. The model suitability test used ANOVA which was analyzed using Minitab software version 19.1.1. The results of simultaneous optimization of the observed parameters obtained a concentration of gum arabic of 8.3% (w/v), maltodextrin of 11.7% (w/v) and whey protein isolate of 5.2% (w/v) with a simultaneous desirability value of 0.7656. This indicates that the optimum formulation will produce phycocyanin microcapsules with characteristics that match the desired target (desirability) 76.56%. Simultaneous response verification results for yield parameters 81.45%; phycocyanin content 3.60%; antioxidant activity 52.36%; encapsulation efficiency 94.48%; phycocyanin retention 61.88%; solubility 93.38% and particle size 205.3 nm. The standard deviation range between the predicted value and the actual value is 0.6718 – 5.2538. Next, the optimum formulation was tested for stability against temperature (45 °C, 60 °C, 75 °C), light intensity (1000 lux, 2500 lux and 4000 lux) and pH (4,5,6,7 and 8) with parameters of phycocyanin degradation, antioxidant activity degradation and *Total Color Difference* (TCD) and phycocyanin content. The results of the stability of phycocyanin microcapsules show that temperature treatment and light intensity in light treatment have a significant effect on phycocyanin degradation, antioxidant activity and *total color difference*. However, light intensity treatment in dark storage did not have significant effect. In addition, phycocyanin microcapsules have the best stability at pH 6 conditions.

Keywords: Microcapsules, RSM, Stability, Optimization, Desirability