INTISARI

Minyak biji labu kuning (MBLK) merupakan salah satu minyak nabati fungsional. Salah satu tahapan penting yang menentukan kualitas minyak nabati adalah proses ekstraksi minyak. Selain itu, adanya minyak pemalsu juga dapat mempengaruhi kualitas minyak nabati yang dihasilkan. Oleh karena itu, tujuan penelitian ini adalah mengetahui pengaruh metode ekstraksi terhadap karakteristik fisiko-kimia, komposisi asam lemak, dan aktivitas antioksidan MBLK serta autentikasinya.

Ekstraksi MBLK menggunkan metode *hot pressing*, Soxhlet, dan *ultrasound-assisted extraction* (UAE) dengan praperlakuan sampel menggunakan radiasi *microwave*. Karakteristik fisiko-kimia ditetapkan berdasarkan metode AOAC, komposisi asam lemak ditetapkan dengan kromatografi gas. Aktivitas antioksidan MBLK ditetapkan dengan metode penangkapan radikal *2,2 diphenyl-1-picryhydrazyl* (DPPH), *2,2'-azinobis(3-ethylbenzothiazoline-6-suslfonic acid)* (ABTS), dan *β-carotene bleaching*. Pemindaian MBLK menggunakan *Fourier-Transform Infrared* (FTIR). MBLK diklasifikasikan menggunakan *Cluster analysis* (CA), *principal component analysis* (PCA), dan *discriminant analysis* (DA), serta dikuantifikasi menggunakan *partial least square* (PLS) dan *principal component regression* (PCR).

Rendemen minyak terbanyak 39,65% diperoleh pada metode Soxhlet, diikuti oleh metode UAE (28,13%) dan 24,12% pada metode *hot pressing*. Karakteristik fisiko-kimia MBLK dari ketiga metode berkisar antara 4,37-8,63 mg KOH/g minyak (bilangan asam), 145,28-195,27 mg KOH/g minyak (bilangan penyabunan), 81,47-113,61 g I_2/100 g minyak (bilangan Iodium), dan 3,15-5,61 meq/kg (bilangan peroksida). Komposisi asam lemak MBLK didominasi oleh 4 jenis asam lemak yaitu palmitat, stearat, oleat, dan linoleat. Sampel MBLK asal Gunung Kidul memiliki aktivitas antioksidan tertinggi baik pada metode penangkapan radikal DPPH (98,71 ± 0,02%) maupun ABTS (88,08 ± 0,18%) pada konsentrasi MBLK 0,16 mg/mL dan 0,8 mg/mL secara berturut-turut dengan kadar fenolik total sebesar 142,61 µg ekivalen asam galat/g minyak. MBLK asal Pati yang diekstraksi dengan metode Soxhlet menunjukkan aktivitas antioksidan tertinggi (73,28±1,26%) pada metode *β-carotene bleaching* pada konsentrasi MBLK 125 µg/mL. Kalibrasi multivatiat PLS dengan menggunakan spektra FTIR derivatif pertama dapat digunakan untuk memprediksi aktivitas penangkapan radikal DPPH MBLK, mengkuantifikasi MBLK dalam campuran biner dan terner dengan nilai R^2 > 0,99 untuk kalibrasi dan validasi dengan nilai kesalahan terendah. Selain itu, metode DA mampu mengelompokkan MBLK murni dan MBLK yang dipalsukan dengan menggunakan 10 *principal component*.

Kata kunci: minyak biji labu kuning, ekstraksi, karakteristik fisiko-kimia, autentikasi, kemometrika.

ABSTRACT

Pumpkin seed oil (PSO) is one of functional edible oils. Extraction of edible oils from its sources is one of critical points in determining the oil quality. The objective of this research was to know the effects of extraction techniques on the physico-chemical properties, fatty acid composition and antioxidant activities of PSO as well as to authenticate of PSO in order to assure the quality of oils obtained.

In this research, some extraction techniques namely hot pressing, Soxhlet, and ultrasound assisted extraction (UAE) treated with microwave radiation were used. The physico-chemical characteristics were determined according to Association of Official Analytical Chemists (AOAC) method, while fatty acid composition was analysed using gas chromatography. Antioxidant activities of PSO were determined using radical scavenging activities toward *2,2 diphenyl-1-picryhydrazyl* (DPPH) and *2,2'-azinobis(3-ethylbenzothiazoline-6-suslfonic acid)* (ABTS) as well as β-carotene bleaching. For multivariate analysis purpose, PSO was scanned using Fourier-transform infrared (FTIR) spectrophotometer. PSO was classified using Cluster analysis (CA), principal component analysis (PCA), and discriminant analysis (DA), while quantification of oil adulterants was performed using multivariate calibrations of partial least square (PLS) and principal component regression (PCR).

The results showed that the yield of PSOs obtained using different extraction techniques were 39.65% (Soxhlet), 28.13% (UAE) and 24.12% (hot pressing). The characterisctics of PSOs as determined by some constanta were 4.37-8.63 mg KOH/g (acid value), 145.28-195.27 mg KOH/g (saponification value), 81.47-113.61 g I_2/100 g (iodine value), and 3.15-5.61 meq/kg (peroxide value). The fatty acids determination revealed that palmitic, stearic, oleic and linoleic dominate the composition. PSO from region of Gunung Kidul had the highest radical scavenging activity with inhibition percentage of 98.71 ± 0.02% (using DPPH radical) and 88.08 ± 0.18% (ABTS radical) at concentration of 16 mg/mL and 8 mg/mL, respectively with total phenolics contents of 142.61 µg gallic acid equivalent/g oil. Meanwhile, PSO from Pati extracted using Soxhlet revealed the highest antioxidant activity of 73.28 ± 1.26% using *β-carotene bleaching* method at concentration of 125 µg/mL. The multivariate calibration of PLS using the first derivative of FTIR spectra could be used for predicting DPPH radical scavenging activity of PSO, and quantifying PSO in the binary and ternary mixtures with other oils with $R^2 > 0.99$ for the relationship between actual and predicted values either in calibration or validation models and the lowest error values. In addition, discriminant analysis could classify pure PSO and that adulterated with other oils using 10 principal components.

Keywords: pumpkin seed oil, extraction, physico-chemical characteristic, authentication, chemometric.