RECOVERY KAROTENOID *CRUDE PALM OIL* MENGGUNAKAN KARBON AKTIF *MESOPOROUS* DARI CANGKANG SAWIT

INTISARI

Recovery karotenoid *crude palm oil* penting dilakukan sebagai upaya penyediaan karotenoid untuk produk pangan maupun farmasi. *Recovery* karotenoid *crude palm oil* dapat dilakukan menggunakan metode adsorpsi-desorpsi tanpa mengubah sifat kimia minyak. Karbon aktif cangkang sawit *mesoporous* dimungkinkan dapat sebagai adsorben dalam me-*recovery* karotenoid dari *crude palm oil*. Penelitian ini bertujuan untuk memperoleh karbon aktif *mesoporous* dari cangkang sawit dan mengetahui potensinya dalam me-*recovery* karotenoid *crude palm oil,* sehingga diperoleh konsentrat karotenoid.

Penelitian ini dibagi dalam 3 tahap. Tahap I adalah pembuatan karbon aktif cangkang sawit, yang diawali dengan penentuan metode pembuatan karbon aktif, dilanjutkan penentuan kondisi pembuatan karbon aktif dan pembuatan karbon aktif serta karakterisasi sifat tekstural dan kimia permukaan karbon aktif cangkang sawit yang dihasilkan. Tahap II adalah seleksi dan produksi karbon aktif cangkang sawit untuk *recovery* karotenoid *crude palm oil*, yang diawali dengan penentuan kondisi adsorpsi-desorpsi karotenoid menggunakan karbon aktif standar sebagai model, diikuti seleksi karbon aktif cangkang sawit berdasar kapasitas adsorpsi β-karoten dan efisiensi desorpsinya, selanjutnya karbon aktif cangkang sawit terpilih diproduksi. Tahap III adalah *recovery* karotenoid *crude palm oil* menggunakan kromatografi kolom, yang diawali dengan preparasi *crude palm oil*, penentuan kondisi pemisahan karotenoid, dilanjutkan *recovery* karotenoid dan penentuan kemampuan karbon aktif cangkang sawit dalam me-*recovery* karotenoid sehingga diperoleh konsentrat karotenoid dan minyak sebagai produk samping.

Hasil penelitian menunjukkan bahwa karbon aktif cangkang sawit *mesoporous* dapat dihasilkan dengan aktivasi kimia menggunakan asam fosfat. Karbon aktif cangkang sawit dengan rasio impregnasi 2 mL/g dan waktu karbonisasi 60 menit (AC260) memiliki efisiensi desorpsi β-karoten tertinggi. Karbon aktif AC260 untuk *recovery* karotenoid *crude palm oil* memiliki luas permukaan 1443,47 m^2/g, total volume pori 0,85 cm^3/g, volume mesopori 0,19 cm^3/g dan volume mikropori 0,60 cm^3/g. Permukaan karbon aktif non polar diperoleh dari gugus fungsional *CH (aliphatic compound), C≡C (acetylenic), C-H (ester), C=C-C (aromatic), C-H (methyl)* dan *C-H (alkyne),* sedangkan permukaan polar dari *OH (phosphorus oxyacid), NO_2 (aromatic nitro compound), organic sulfate, C-N (amine)* dan *C-OH (alcohol).* Karotenoid *crude palm oil* dapat di-*recovery* sebanyak 15,60±2,88% dan terjadi pemekatan 8 kali, dengan kadar karotenoid mencapai 4061,86±628,68 ppm. Minyak hasil pemisahan masih memiliki kualitas sebagai *edible oil.*

Dari hasil penelitian dapat disimpulkan bahwa karbon aktif cangkang sawit *mesoporous* dapat digunakan sebagai adsorben untuk *recovery* karotenoid *crude palm oil* menggunakan metode adsorpsi-desorpsi dan diperoleh konsentrat karotenoid serta minyak sebagai produk samping. Adsorpsi-desorpsi karotenoid dipengaruhi oleh luas permukaan, total volume pori, volume mesopori dan polaritas permukaan karbon aktif.

Kata kunci: *Crude palm oil*, karotenoid, karbon aktif cangkang sawit, adsorpsi, desorpsi

RECOVERY OF CAROTENOIDS FROM CRUDE PALM OIL USING MESOPOROUS PALM KERNEL SHELL ACTIVATED CARBON

ABSTRACT

Recovery of palm carotenoid is important to do as an effort to supply carotenoids for food and pharmaceutical products. Palm carotenoid recovery could be performed using the adsorption-desorption method without altering the chemical properties of the oil. Palm shell activated carbon had the potential as an adsorbent to recover carotenoid. This study aims to obtain the mesoporous palm shell activated carbon and to know the potential of palm shell activated carbon for the recovery of palm carotenoid so that obtained carotenoid concentrate.

The study was divided into 3 stages. Stage I is palm shell activated carbon making, which begins with a determination of making activated carbon method, followed by the determination of the activated carbon production process conditions, manufacture of activated carbon and characterization of textural and chemical properties. Stage II is selection and production of palm shell activated carbon for the palm carotenoid recovery, beginning with the determination of carotenoid-absorption-adsorption conditions using standard activated carbon as a model, followed the selection of palm shell activated carbon based on β-carotene desorption efficiency, further palm shell activated carbon of selected, then were produced. Stage III is palm carotenoid recovery using column chromatography, which begins with the preparation of crude palm oil, determination of carotenoid separation conditions, continued carotenoid recovery and determination of palm shell activated carbon capability in the recovery of carotenoids so that obtained carotenoid concentrate and byproduct of edible oil.

The results showed that palm shell activated carbon could be produced by chemical activation using phosphoric acid followed by carbonization. The palm shell activated produced with the impregnation ratio of 2 mL/g and carbonization for 60 min (AC260) had the highest desorption efficiency. Palm shell activated carbon of AC260 for palm carotene recovery had surface area 1443.47 m^2/g, total pore volume 0.85 cm^3/g, mesopore volume 0.19 cm^3/g and micropore volume 0.60 cm^3/g. The non-polar activated carbon surface was obtained from the functional group of C-H (aliphatic compound), C≡C (acetylenic), C-H (ester), C=C-C (aromatic), C-H (methyl) and C-H (alkyne), whereas polar surface from O-H (phosphorus oxyacid), NO_2 (aromatic nitro compound), an organic sulfate, C-N (amine) and C-OH (alcohol). Palm carotenoid could be recovered as much as 15.60 ± 2.88% and occur concentration 8 times, with carotenoid levels reaching 4061.86 ± 628.68 ppm. The oil recovered had quality as raw edible oil.

From the results of this study, it can be concluded that the mesoporous palm kernel shell activated carbon can be used as an adsorbent to recover carotenoid from crude palm oil using the adsorption-desorption method and was obtained carotenoid concentrate. Carotenoid adsorption was affected by surface area, total pore volume, mesoporous volume and active surface carbon polarity.

Key words: Crude palm oil, carotenoid, palm shell activated carbon, adsorption, desorption