

PRELIMINARY STUDY ON COCONUT OIL EXTRACTION AT AMBIENT CONDITIONS

by

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of the requirements for the degree
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APPROVAL AND DECLARATION SHEET

This project report titled Bioprocess Purification Development of Octanol Found In Natural Essential Oil Products Using Sub-Critical Solvents was prepared and submitted by Pui Yun Kiong (Matrix Number: 081140921) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Bioprocess Engineering) in Universiti Malaysia Perlis (UniMAP).

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KAJIAN AWAL TERHADAP EXSTRAK MINYAK KELAPA PADA KEADAAN AMBIEN

ABSTRAK

Objektif projek ini adalah untuk menentukan kesan suhu dalam setiap kaedah ekstraksi, untuk mengkaji keberkesanan pengekstrakan pelarut subkritikal berbanding dengan pengekstrakan superkritikal pelarut dalam kajian sebelumnya dan untuk menganalisis komposisi dan ciri-ciri terma penulenan produk. Pengekstrakan pelarut subkritikal adalah untuk mengeluarkan oktanol dari minyak kelapa pada suhu antara 50 °C hingga 90 °C pada tekanan atmosfera. Pengekstrakan dan pengasingan keseluruhan adalah malar pada 120 minit. Hasil produk ditentukan dan dianalisis. Produk dikaji melalui Spektroskopi Fourier Transform Infra merah (FTIR), dan Kalorimetri Imbasan Pembezaan (DSC). Daripada keputusan tersebut, didapati hasil pengekstrakan penyulingan ringkas adalah lebih rendah berbanding pengekstrakan secara kukusan air. Regangan oktanol akan muncul pada 3200-3550 cm⁻¹. Tenaga aliran mengaktifkan adalah 26312,48 KJ/kmol. Minyak kelapa telah menunjukkan julat lebur 17–32 °C yang setanding dengan DSC pada kadar pengimbasan 2 K/min. Kesimpulannya, pengekstrakan kukusan air dapat mengekstrak lebih banyak hasil dari minyak kelapa berbanding dengan penyulingan ringkas dalam suhu dan tekanan yang sama. Kaedah pengekstrakan termaju, iaitu pengekstrakan pelarut superkritikal, adalah lebih berfaedah dalam penulenan oktanol.

ABSTRACT

The objectives of this project were to determine the effect of the temperature in each of the extraction method, to study the effectiveness of subcritical solvent extraction in comparison with supercritical solvent extraction in the previous studies and also to analyse the composition and thermal characteristic of product. Subcritical solvent extraction was extract octanol from coconut oil at temperatures between 50 °C to 90 °C at atmosphere pressures. Overall extraction and separation were constant at 120 minutes. The product was investigated through the Fourier Transform Infra-red Spectroscopy (FTIR), and Differential Scanning Calorimetry (DSC). From the result, the yield of water bath extraction was less than simple distillation. The peak of octanol will be appear at approximately 3200-3550 cm^{-1} . The flow activating energy was 26312.48 kJ/kmol. Coconut oil was showed the melting range of 17 – 32 °C which was comparable to DSC at scanning rate of 2 K/min. In conclusion, water bath extraction was able to extract more yields from coconut oil compared to simple distillation in same temperature and pressure. The advance extraction method which is supercritical solvent extraction is more advantageous in purification of octanol.

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LIST OF SYMBOL, ABBREVIATION AND NOMENCLATURES

CO ₂	Carbon Dioxide
FTIR	Fourier Transform Infra-red Spectroscopy,
DSC	Differential Scanning Calorimetry,
VCO	Virgin Coconut Oil
C-O	Carbon Oxygen bond
C-H	Carbon Hydrogen Bond
O-H	Oxygen Hydrogen Bond
A	Constant
E _A	Flow Activation Energy (kJ/kmol)
R	Universal Gas Constant (kJ/kmol·K)
T	Absolute Temperature (K).
K	Response Factor
P	Absolute Pressure
V	Molar Volume
a and b	Parameters that are determined empirically for each gas.
w ₁	Weight of Oil, g
w ₂	Weight of substance to extract, g