

**UNIVERSITI TEKNOLOGI MARA**

**EXTRACTION OF *PHOENIX*  
*DACTYLIFERA* SEEDS OIL USING  
SUPERCRITICAL CARBON DIOXIDE**

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Thesis submitted in fulfilment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Chemical Engineering**

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## CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 16th July 2014 to conduct the final examination of Noor Aiysah Binti Aris on her Master of Science thesis entitled “Extraction of *Phoenix dactylifera* Seeds Oil Using Supercritical Carbon Dioxide” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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## AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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## ABSTRACT

Date fruits (*Phoenix Dactylifera* L.) contain high nutrients such as carbohydrate, fat, protein, dietary fibre, vitamins, minerals and antioxidant. However, the waste (seeds) from date fruit was always neglected since it cannot be consumed as it is, although it contains lots of nutrient same as the fruit. Most of the previous researcher extracted date seeds oil using conventional method. However, the conventional method for extraction of date seeds oil by using organic solvent is toxic and harmful towards human and environment. Thus, supercritical carbon dioxide (SC-CO<sub>2</sub>) extraction method is introduced as a clean technology to extract oil from date seed. It can also be an alternative method to replace the current conventional method which utilized organic solvent. The objectives of this study are to extract oil from date seed type Mariami from Middle East, within a range of temperature (40, 50, 60, 70 and 80°C) and pressure (27.6, 34.5, 41.4, 48.3 and 55.2MPa). In addition, to determine the best condition for highest oil yield, to identify the valuable components in the oil using gas chromatography equipped with mass spectrometry (GC-MS) and also to model the solubility data of date seed oil in SC-CO<sub>2</sub>. The highest oil yield achieved was 3.3% with the solubility of 0.174 g oil/kg CO<sub>2</sub> achieved at pressure 55.2MPa and temperature of 50°C. Analysis of component in the oil using GC-MS showed that the components detected were lauric acid, myristic acid, palmitic acid, linolelaidic acid, laurostearic acid, oleic acid, stearic acid and ascorbyl palmitate. Solubility data from experiment fitted well with the correlation model. Based on Paired T-test analysis, Chrastil model, Del Valle-Aguilera model and Adachi-Lu were found to correlate well with the experimental data with coefficient correlation (R<sup>2</sup>) of 0.941, 0.940 and 0.917 respectively. Therefore, Chrastil model, Del Valle-Aguilera model and Adachi-Lu model are suitable to represent the thermodynamic modeling of solubility date seed oil in SC-CO<sub>2</sub> at temperature range 40-80°C and pressure range 27.6-55.2MPa.

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