COMPARISON BETWEEN HYDRODISTILLATION AND SUPERCRITICAL FLUID EXTRACTION USING *CURCUMA LONGA* AS SOURCE OF ESSENTIAL OIL

ZSA ZSA BT MOHD NASIR

Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Applied Chemistry
in the Faculty of Applied Sciences
Universiti Teknologi MARA

APRIL 2009

This Final Year Project Report entitled "**Comparison Between Hydrodistillation and Supercritical Fluid Extraction using *Curcuma longa* as Source of Essential Oil**" was submitted by Zsa Zsa bt Mohd Nasir in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Applied Chemistry, in the Faculty of Applied Sciences, and was approved by

Pn. Norjanah bt Yury
Supervisor
B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor

Dr. Nor Azah bt Mohd Ali
Co-Supervisor
Department of Medicinal Plants Devision
Forest Research Institute Malaysia
52109 Kepong
Selangor

Ms. Sabrina M. Yahaya
Project Coordinator
B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor

Prof. Madya Dr. Yusairie Mohd
Head of Programme
B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor

Date: 25 May 2009

ACKNOWLEDGEMENTS

All praise be to Allah SWT and blessings be upon His Prophet Muhammnad SAW whose ultimate guidance creates more meaningful purpose for this work.

First of all, I wish to express my sincere gratitude and appreciation to the people, who have both directly contributed to this thesis. To my Supervisor Pn. Janah bt Yury and Co-supervisor, Dr. Nor Azah bt Mohd Ali from Forest Research Institute Malaysia (FRIM), for their guidance, constant encouragement, freedom of work and endless support to my work while conducting this project.

Gratitude and special thanks are extended to all staff at the Forest Research Institute Malaysia, especially Ms. Saidatul Husni bt Saidin, Ms. Mailina bt Jamil and En. Farid for their valuable guidance and assistance.

Last but not least, to my family, thanks a lot for all support, understanding and the entire love.

Zsa Zsa bt Mohd Nasir

TABLE OF CONTENTS

ABSTRACT

VARIOUS METHODS OF EXTRACTION OF ESSENTIAL OIL FROM CURCUMA LONGA

Attention is drawn to the use of new and clean alternative methods for the isolation of essential oils from plants. Turmeric oil was extracted from the rhizome of turmeric (*Curcuma longa*) with supercritical carbon dioxide method and a conventional method (hydrodistillation). The two methods were compared based on time of extraction, identification of major compound, cleanliness of essential oil obtained and oil yield. For hydrodistillation method, the rhizome of *Curcuma longa* gave a light yellow oil with 1.4% of oil yield on a fresh weight basis. For SFE method, extraction rate was measured as a function of pressure and temperature. The optimum condition for maximum yield of oil from this experiment was at a pressure of 200 bar with 1.7% oil yield. At constant pressure, the extraction efficiency decreased with increased in temperature and at constant temperature, the extraction rate was increased together with pressure due to the change in solubility of essential oil. The two methods successful in identifying the major compound in *Curcuma longa*, that is ar-turmerone. The difference was the time taken to extract the major compound. SFE method was faster than the conventional method. The number of compounds extracted from SFE method were fewer compared to hydrodistillation method due to reduction in the amount of water in SFE method reduces degradation of compound by hydrolysis, trans-esterification or oxidation and oil extracted is clean from solvent. The experimental results indicated that the turmeric oil could be efficiently extracted by SFE.