UNIVERSITI TEKNOLOGI MARA

NEUROPROTECTION, HMGR INHIBITION, VITAMIN E QUANTIFICATION AND ANTIMICROBIAL PROPERTIES OF PALM PUREE

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Thesis submitted in fulfillment of the requirements for the degree of Master of Science

Faculty of Applied Sciences

May 2015
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

Palm Puree (PP) is a value-added product prepared from squeezed fruitlets of oil palm fresh fruit bunches. Fiber was incorporated at different percentages for samples T24 and PT99 at 2% and 5% fiber incorporated for each sample, respectively. The study was carried out to determine the potential nutritional benefits of PP such as neuroprotection, 3-hydroxy-3-methylglutaryl-coenzyme A reductase (HMGR) inhibition and antimicrobial properties. Neuroprotection properties were observed in infant brain cancer; human neuroblastoma cell line SH-SY5Y differentiated by treatment of retinoic acid and induced with H$_2$O$_2$. The samples gave negative neurotoxicity results and promising neuroprotective effects on 80% confluent SH-SY5Y cell line in 96 well plates at a dose dependent manner. PT99 displayed most protection against H$_2$O$_2$-induced cell lines and followed by T24 at 100 µg/mL (p<0.05). The HMGR inhibition assay aims to find the cholesterol lowering ability of PP using pravastatin, a known HMGR inhibitor as control. T24/5 gave a considerably better oxidation of NADPH at 0.159 Units/mgP, followed by PT99/5 (0.009 Units/mgP) as compared to pravastatin. Antimicrobial testing against selected pathogenic bacteria and fungi infecting human were performed using well diffusion method at concentrations of 200 µg/ml, 300 µg/ml, 500 µg/ml, 800 µg/ml and 1 mg/ml. The test showed negative results as no inhibitory activities were observed. The HPLC analysis showed that the four vitamin E derivatives identified in all PP samples were α-T3, γ-T3, δ-T3 and α-TP. T24 exhibited significantly (p<0.05) higher total amount of vitamin E as compared to PT99. In conclusion, PP can be used as a healthy value-added product for human consumption.
ACKNOWLEDGEMENT

Alhamdulillah. My heartiest prayers to Allah s.w.t, the Benevolent and All Mighty and Prophet Muhammad ﷺ for His countless blessing, for this soul, for this colourful journey called life.

All my love and gratitude to my supervisors, Assoc. Prof. Dr. Zainon Mohd Noor and Assoc. Prof. Dr. Mohd Faiz Foong Abdullah for reading through countless drafts and improve it with their comments. For their encouragement over the years. For source and sustenance.

Special heartfelt thanks to my beloved parents, Rosni Abdul Ghani and Norhilmi Othman; brothers, Zainal Abidin, Muhamad Khairul Akmal and Hasrol Basri; and families for the unwavering support. And, as always, my incomparable love and appreciation to my dearest husband, Saifulzully Azraei Saifuddin, who often believe in me more than I do myself. Thank you.

I would like to acknowledge the enormous help given to me in completing this thesis. For their memories, their patience and their guidance, I wish to thank Puan Aziyah Abdul Aziz, Puan Mazatulikhma Mat Zain, Encik Ahmad Khambali, Encik Johari Saffar, Puan Nadzarah Abdul Wahab, Puan Fatihatul Zuriati Makmon, Puan Nelliza Mohd Nawi, Mohamed Jemain Ridhwan, Puan Ida Hani Ali, Khalida Ain Najihashahila Kusnan, Sharif Sarman@Bakri, Mohd Hafiz Mohd Rothi, Faizal Badaruddin, Wan Mohamed Afie Wan Noordin, Nor-Aainaa Zandar, Puan Norfaezah Mazalan, Intan Hasbullah, Zainuddin Roossdi, Afifuddin Habulat, Puan Nurul Azyla Azmi, Puan Nor Aziah Abu Bakar and the multitude of Faculty of Applied Sciences, Institute of Science (IOS) and Research Management Institute (RMI), Universiti Teknologi MARA (UiTM) Malaysia’s postgraduates, friends and colleagues. Not forgetting the Institut Pengajian Siswazah (IPSis) / Institute for Graduate Studies (IGS) UiTM Malaysia for their invaluable help throughout this journey.

My deepest appreciation to Sime Darby (M) Sdn. Bhd., Sime Darby Plantation in particular, for providing the sample and sumptuous research grant. Everyone there has been wonderful to work with throughout the past three years. To Assoc. Prof. Dr. Norham Abdulllah and Haswani Maisarah Mustafa, my partner in crime who always leaves me with a smile, thanks for the trust and the friendship. Thank you. Wassalam.
CHAPTER ONE
INTRODUCTION

Oil palm or *Elaeis guineensis* Jacquin is known to be originated from West Africa. In Malaysia, the oil palm was first planted back in 1911 and 1912 as ornamental plants at Rantau Panjang, Kuala Selangor and of the Dura variety which was originated from Deli, Indonesia. In the early years, the oil palm trees were planted on 1.98 million hectares land but it had increased to 3.38 million hectares in 2000, an increase of 170% (Chan, 2002). With it, the oil palm production has increased tremendously thereafter. Palm oil production in Malaysia is estimated to reach 20.5 million metric tonnes (MMT) and 24.6 MMT by 2020 and 2035, respectively, from a total of 6 million hectares of plantations nationwide in order to provide an estimated of 186 million tonnes for the world consumption and export of oils and fats (MPOB, 2013; Yean and ZhiDong, 2012).

Palm oil is edible vegetable oil derived from the fleshy mesocarp of the palm fruit. In the unprocessed form, palm oil is recognized as reddish brown and has a semisolid consistency at ambient temperature (Nair, 2010). Palm oil extracted from the freshly harvested mesocarp of the fruit contains 45 to 55% oil where the colour varies from light green to orange red. In the digester and presser, the separated fruitlets are heated at a temperature of 65 to 90°C for 5 to 15 minutes of digestion (Owolarafe, Olabige and Faborode, 2007, 2008). The processing of fruitlets starts by heating which causes the flesh of the fruit (pericarp and mesocarp) to come loose from the nut. The flesh is crushed and feed gradually into a hydraulic press or a screw press where the oil is extracted under high pressure. The crude oil flows through a vibrating screen which separates out sludge and other coarse contaminant such as fiber, sediments and crushed nuts leaving behind the sediment called the press cake which is a mixture of oil, water and various finely-divided solid materials such as nuts and kernels (Corley and Tinker, 2005; C. H. Tan, Hasanah, Kuntom, C. P. Tan, and Ariffin, 2009).

Palm oil has a strong appeal as an ingredient. This is due to the fact that it is free of artery-clogging *trans* fatty acid or generally known as cholesterol which are formed when fats are hydrogenated to make them more solid at room temperature.