

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
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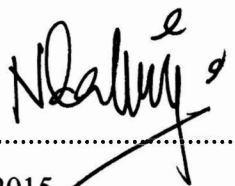
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AUTHOR'S DECLARATION

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

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 H₂O₂. 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 H₂O₂-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.

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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